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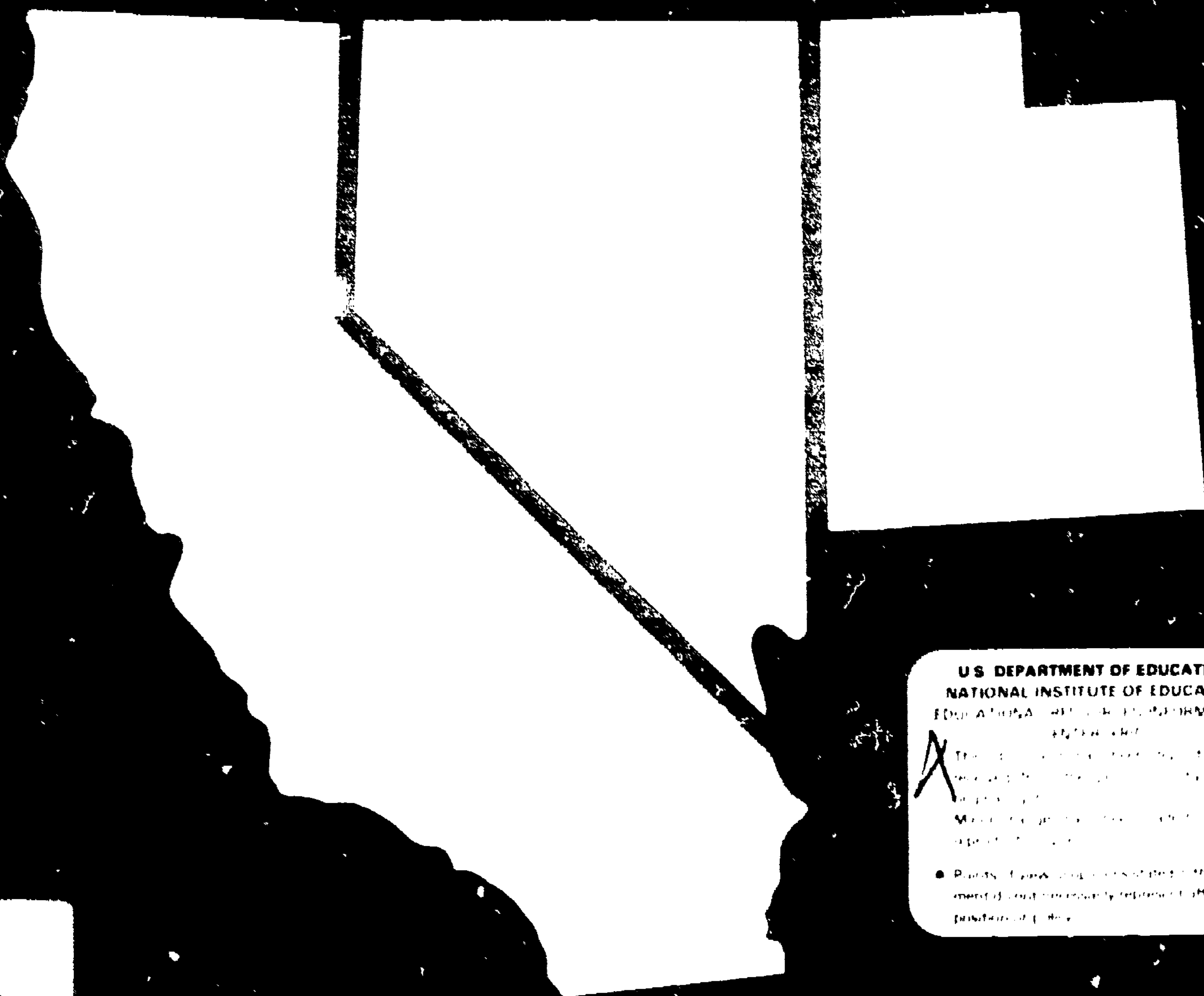
ABSTRACT

This document is a compendium of proceedings from three state conferences held in Salt Lake City (September 13-14, 1983), San Francisco (November 16-18, 1983), and Reno (February 2-3, 1984). These conferences brought together outstanding researchers to share their findings and perspectives with other educators of the region. The proceedings are divided into chapters that reflect the organization of the conference agendas. Chapter 1 consists of four papers on perspectives on effective schools, which offer viewpoints and strategic guidelines for increasing school effectiveness. Chapter 2 consists of three papers on principalship, which set forth issues for school improvement, delineate principal styles. and describe an instructional management academy. Chapter 3 consists of four papers discussing current research into teacher effectiveness. Chapter 4 consists of two presentations on critical thinking skills. Chapter 5 consists of six papers covering various approaches to staff development, including an example from the private sector (Hewlett Packard Co.) and a new state program (the California Mentor Teacher Program). Chapter 6 conists of four papers discussing the problems and potential of microcomputer applications in education and concludes with a description of the California Model Curriculum for Computers in Education. (TE)

making our schools more effective

PROCEEDINGS OF THREE STATE CONFERENCES



Far West Laboratory for Educational Research & Development

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MAKING OUR SCHOOLS MORE EFFECTIVE

PROCEEDINGS OF THREE STATE CONFERENCES

June 1984

FAR WEST LABORATORY FOR EDUCATIONAL RESEARCH AND DEVELOPMENT

FAR WEST LABORATORY BOARD OF DIRECTORS

Introduction

It was just a little over a year ago that the report of the National Commission on Excellence in Education was issued. This report has had a great impact not only on educators but also on the general public. Responses to the report have been written, committees and task forces formed, and reform legislation has been passed. The findings and recommendations of this report, as well as several other important national studies, have provided an impetus for change and a focal point for discussion among educators and concerned members of the community.

The reports accomplished their purposes: the level of concern is high, the public is aware of the problems and needs of the schools, and improvements are expected. There is an opportunity for everyone involved in the public education system to capitalize on the momentum generated by the national reports and to propose and enact school improvement strategies.

What will it take to do this? Most all the national studies recognized a need for administrators and teachers to make use of the data and findings of educational research. A substantial body of knowledge has been generated on effective instructional strategies, on school and classroom management and on school improvement processes that will facilitate educators' efforts.

A central purpose of these three state conferences was to provide a forum for information exchange between educational researchers and practitioners. Far West Laboratory, working in cooperation with the state departments of education in California, Utah and Nevada, invited outstanding members of the educational research community to share their findings and perspectives with other educators in the region.

The Utah conference was held in Salt Lake City, September 13-14; the California conference was held in San Francisco, November 16-18; and the Nevada conference was held in Reno, February 2-3. Since most of the presentations were not given at more than one conference, ISP decided to combine the proceedings of all three conferences and make them available to participants and educators in all three states.

The proceedings are divided into chapters that reflect the organization of the conference agendas. Some of the presentations are edited transcripts of an overview or personal perspective; some are research reports, and others are descriptions of activities conducted in small group sessions.

All three conferences were well attended and received favorable reviews by participants. We hope that some of the "good ideas" and research findings presented at these conferences will be helpful to educators in the planning and decision making associated with their school improvement efforts. We also hope these conferences will be only the first of many opportunities for exchange among educators in the region.

We would like to acknowledge the three state departments of education as partners in the planning and production of the conferences: Utah Superintendent Lee Burningham and his staff members Lerue Winget, Bruce Griffen and Fran Peek; Nevada Superintendent Ted Sanders and his staff members Myrna Matranga and Al Ramirez; and Harvey Hunt, Cathy Barkett, Laura Wagner and Phil Daro of the California State Department of Education. In Utah, the conference was co-sponsored with the Utah State Board of Education and the University of Utah Graduate School of Education. In California we had assistance from the Association of California School Administrators, the Educational Testing Service and Division G of the American Educational Research Association.

ISP staff members, Stanley Chow, Carol Murphy, Tom Ross, Mary Dean and Ellen Hui all worked on various aspects of the planning, production and documentation of these conferences. Finally, we acknowledge the support of the National Institute of Education in helping to make these conferences possible.

Lynn Jenks
Director, Improvement Support Program

June 1984

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CHAPTER 1

PERSPECTIVES ON EFFECTIVE SCHOOLS

Lee S. Shulman
Stanford University

David Clark
Indiana University

William G. Spady
Far West Laboratory

Dale Mann & Judith Lawrence
Columbia University & New York Urban Coalition

"I sometimes get very depressed about John Dewey. He is far more often quoted than read these days. It is possible for someone to get a Ph.D. in education without ever having read a page of Dewey."

"Pay heed to people like Good and Brophy when they say don't confuse effective schools with good schools — if by effective you mean schools in which test scores have gone up. Your job is not over when the test scores have gone up; it has just begun."

"I'd like to suggest a view of an effective school that you will treat as outragecus. I think we ought to define effective schools as those that are educative settings for teachers. To put it another way, I will define as ineffective any school that is so organized that the teachers on that faculty cannot be active learners with as much serious support for that role as the students get."

"Changing the conditions of teaching is a little bit like trying to change the quality of a large lake. It took many years to get it polluted and you're not going to be able to drop a tablet into it and change it overnight — which is why our policymakers, our union leaders, our school administrators have got to have vision."

A PERSPECTIVE ON EFFECTIVE SCHOOLS

Lee S. Shulman
Professor of Education and
Affiliated Professor of Psychology
Stanford University

In 1963 I was interviewed for my first job at Michigan State University by Wilbur Brookover, the chairman of what was to be my department. Brookover had this mad idea that there was something about school climate and school self-concept that was an important determinant of what made school a good place. Of course all of us thought that that was all nonsense; it was how carefully and how behaviorally your objectives were defined that made the difference. But the madness of the sixties passed and Brookover's wisdom was later recognized.

What I'd like to do today is to provide some perspective on the discussion of effective schools. The perspective will require talking a bit about the past because one of the questions we might raise is, "What were we all doing before we were talking about effective schools?" Wasn't anybody concerned with school improvement, and if so, what were they doing? What was guiding our efforts before we had the research data we now have?

I find that my doctoral students tend to be incredibly ahistorical. For them it's an embarrassment to cite a reference that's more than four years old, and I practically have to bludgeon them into taking a course in the history of education. So I hope you'll bear with me if I begin with some discussion of past attempts to improve schooling. It may put some perspective on what we're doing now and since there's a cyclical quality to educational trends, it may also give us some idea of what the future may bring.

Early Images of Effective Schooling

Let me go back to the beginning of this century. On what grounds did people talk about what a good education was, what a good teacher was, what a good school was in 1900 or 1905? They had all kinds of very precise discussions about who were better or poorer teachers, which were better or poorer schools. But by today's standards these discussions were very unscientific. They didn't have test scores to use at the time. All they had were values. All they had were philosophies of education. All they had were commitments and ideologies and well-debated views of the good life and what knowledge was most worth. They had a lot that we in our slavish acceptance of "scientific criteria of outcomes" may have lost as part of the price of our progress. And one of the messages I'll try to

leave you with is that we need not forego the progress we've made through the applications of social science, but perhaps if we return to some concern for those values and perspectives we'll be further ahead.

Let me tell you what I mean. The most important influence on the thinking about teaching that occurred in those days was the work of John Dewey. I sometimes get very depressed about John Dewey. Like another great thinker of his age, Sigmund Freud, he is far more often quoted than read these days. It is possible for someone to get a Ph.D. in education without ever having read a page of Dewey. But there was a Dewey, and he did have quite an impact. The impact he had was in communicating to several generations of educators an image of the good classroom and the good school. The image was based on his concept of a good society, a democratic society in which people made decisions about their respective well-being through deliberation, through discussion, through the exercise of reason and knowledge.

And if this was the way a good society looked, then it ought to be mirrored at every level of society--so that a government should work that way, a school should work that way, and a classroom should work that way. That was his first point. His second point was that if children were to grow up to be adults who had to take their place in that kind of society they had to have practice. Teachers need practice; we call it practice teaching. Physicians need practice; we call it rotating internships and residencies. Airline pilots need practice; they use simulators before they go out into the real thing. Children need practice, and the practice environment for citizenry is called a classroom according to Dewey. And if you knew what a good society looked like, you could go into a classroom and ask, "Is this the kind of place that's giving kids that opportunity?"

But Dewey was a very complicated man. He didn't stop there. He also had an idea that knowledge was something that people invented. They produced it; they did it actively. It was called experimenting, devising instruments to make the world reveal secrets it wasn't going to reveal by itself. It meant asking and inquiring. You didn't learn about the world from sitting back until it told you something when it felt like it. Given this idea of knowledge, someone could go into a classroom and watch the way knowledge was dealt with in that classroom, and he could say, "Yes, that is an approximation of the way in which knowledge is created and transmitted," or "No, that is not."

What I'm coming to here is the notion that there were images of good education, of good teaching and good learning, of good school settings, and they were not naive or ideological. They came from a very careful and thoughtful appraisal. And it wasn't only Dewey; there were many others as well who spoke not only of what it meant to gain knowledge and competence so that you could be a productive

member of a democratic society but also of how to apply those principles to the study of schools.

Ralph Tyler and his group at Ohio State and then later at the University of Chicago completed the most remarkable and extensive study of schools ever done--the Eight Year Study. It was a remarkable study of progressive schools and their consequences. The study was based on a normative concept of good schooling.

Let me now distinguish between a normative view of a good school and what I'll call an empirical view. An empirical view defines a good school by its outcomes--a change in test scores, or employment rate, decreases in delinquency rates, improved attendance rates or some combination of these. You define what a good school is on the basis of measures of these empirically derived outcomes. A normative view of a good school is the view that I've been describing in the last few minutes. This view is based on an analysis of what you believe is of greatest value and is determined by the comparison between those standards and what you observed.

Let me give you a specific example of this normative approach. We're used to looking at effective teaching studies by asking the question "Which of these approaches obtains the highest gains in reading performance?" But a very influential study was done a few years ago by Dolores Durkin at the University of Illinois Center for the Study of Reading. She went to a number of classrooms and asked a somewhat different question: "Can I find any instances in which reading comprehension is taught, and if so under what conditions?" She didn't go out looking for outcomes; she had a normative model, a model of what reading comprehensive instruction looked like. She distinguished between having the child read silently and fill out a work sheet and giving the child some instruction about how to comprehend, followed by strategies for making sense out of reading passages. She wasn't asking, "How do students do on test scores?"; she was saying, "Can I find examples of that kind of instruction, and if so under what conditions?" That's an example of an effectiveness study that uses a normative criterion. And as some of you may know, her results were very distressing. She found almost no instances of instruction in reading comprehension. When she asked teachers if they taught comprehension, the answer was always yes. But when she asked how, it was almost always, "they read and then I give them comprehension exercises to fill out and I mark them and I give them back."

During the late fifties and early sixties, the kind of research that was done on effectiveness in general was normative. In these studies the outcomes were based on democratic values, not empirical indicators of achievement. And it is out of this atmosphere that what we now identify as the effective schools movement then developed. It was a very important movement--and it still is. The late sixties was the era of the Coleman Report--when we were told that schools didn't make much of a difference, that there are other

more powerful influences in the society. At the same time this was the era of the student uprisings, the 1968 Democratic Convention and Kent State. People began to get very skittish about the absence of discipline, the absence of direction, the absence of control in our schools.

And somehow out of this matrix developed a very fascinating body of research. It's the research which to this day has continued as the mainstream of effective teaching and effective schools research. It is an empirical stream that says we can identify the patterns of teaching in classrooms and the forms of organization and management in schools that predictably result in increased performance on achievement tests for young people. Schools do make a difference, and, in fact, the way they make a difference is by foregoing a lot of this Deweyan nonsense and putting the control back in the hands of the teachers. An extraordinarily well-crafted tradition of research on direct instruction and time-on-task changed the rules by saying the normative view is inadequate. We can't simply go in and apply these general images of the good school. We've got to anchor these judgments in something we can depend on, and let's try achievement test scores. At the same time, researchers acknowledged that test scores don't measure everything that's worthwhile about a school. They are an indicator of an important but narrow range of what schools are about. They have continually warned us not to confuse effectiveness as measured by that standard with effectiveness in general. Don't confuse the score for everything else the school is responsible for accomplishing.

Three Nightmares about Education

About a year ago I was asked to comment on an emerging conflict between policymakers who wanted to fulfill their obligations to improve the quality of schooling for all children by writing regulations that would ensure all kids an equal opportunity and the teaching profession that said, "We know what we're doing. Don't try to mandate everything we do." Let me share with you the observations I made at that time. By the way, they appear in a book that Gary Sykes and I have edited called The Handbook of Teaching and Policy.

I began by saying that what unfortunately motivates people to choose courses of action is rarely the ideals they pursue; more often it's the nightmares they're trying to avoid. We often choose what we want to do to avoid what frightens us rather than out of the motivation to accomplish what we value most. The participants in the struggles over teaching and public policy all have their nightmares. Many of the policymakers have a vision of teachers who do not teach--or teach only what they please to those who please them, who prefer a transient fad to the tougher less rewarding regimen of achieving tangible results in the basic skills, who close their schoolhouse doors and hide their incompetence behind union-sheltered resistance to accountability and merit pay, whose low expectations of the intel-

lectual prowess of poor children lead them to neglect their pedagogical duties toward the very groups who need instruction most desperately, or whose limited knowledge of the sciences, mathematics, and language arts results in their misteaching the most able. Many policymakers see an unwilling or inept teacher resisting the implementation of policies based on research that are designed to help children and to benefit the greater society. That's the policymaker's nightmare.

Teachers have their own nightmare, that of a besieged and beleagured group of dedicated professionals, inadequately appreciated or compensated, attempting to instruct reasonably and flexibly under impossible conditions. They are subject to countless mandates and directives emanating from faceless bureaucrats pursuing patently political agendas. Not only do these policies frequently dictate absurd practices, but they also typically conflict with the policies transmitted from other agencies, from the courts, or from other levels of government. Each new policy further erodes the teacher's control over the classroom for which he is responsible. Pupils are yanked willy-nilly out of the room for special instruction, disrupting the continuity of their classroom experience and upsetting the normal flow of classroom life for everyone else. A larger number of children--bussed children and handicapped children--and inexperienced aides must be accommodated in the classroom while at the same time the teacher must take on an extra hour a day of reading, a new writing initiative, more rigorous mathematics and science, sex education, bi-cultural education, and in her spare time, carefully maintain the detailed individual records needed to create the bureaucrat's audit trail. That's the teacher's nightmare.

So that teachers and bureaucrats weren't the only ones who were losing sleep at night, I thought it was important to add to those two nightmares a third nightmare--the researcher's nightmare. Researchers have their own version of the nightmare. In it they see both policymakers and practitioners pursuing their respective chores mindlessly without benefit of the carefully collected, sifted, analyzed, and interpreted bodies of knowledge that constitute the stuff of educational scholarship. This body of work includes both the most esoteric products of basic social science research and the concrete results of large scale surveys and experiments as well as the rich descriptive portraits of educational ethnographers. The scholar's nightmare is of an educational system at all levels uninformed by the wisdom of research, unguided by the lessons of scholarship.

I would add one additional nightmare, one that I think we see all too often. That's the nightmare that my teacher Joe Schwab referred to thirty years ago in an article he dubbed "On the Corruption of Education by Psychology." It is the nightmare that occurs when a researcher, who can only do research by limiting a problem, by controlling variables, by focusing in on a rather limited set of events so that they can be seen clearly and understood, finds those results applied broadly and generalized well beyond the

confines of the circumstances in which they were originally investigated. So on the one hand, educational researchers say please don't overgeneralize our work, but on the other hand, please don't ignore us. We've had a lot of experience being ignored, and we aren't saying to stop applying our work. What we really mean is look at it carefully, understand it in its own terms, recognize its implications and its limitations, and apply it judiciously.

Making Your School More Effective

What I'd like to do in the last part of this talk is not to ask you to stop paying attention to the research on effective teaching and effective schools. No, I want you to pay more attention to it than you may have before. I want you to take it seriously and the way to take it seriously is to understand it for what it can and cannot do with respect to the guidance of educational policy and practice. Pay heed to people like Good and Brophy when they say don't confuse effective schools with good schools--if by effective you mean schools in which test scores have gone up. Your job is not over when the test scores have gone up; it has just begun. It may very well be that since almost all the effective schools research has been done in schools where test scores were very, very low to begin with and the job was to get them up to the national median, that the conditions for making average schools excellent may be totally different from the conditions for making poor schools minimally effective. That's one of those limitations that's built into research. If you were doing medical research, you would not generalize from what's good for a common cold to what's good for cancer. You'd know that solutions are situation-specific. Well, that's true in the social sciences and education as well. So one of the important points I want to make is take the work seriously. Look at it with the kind of critical eye that the scholars who conduct the research use to look at each other's work and which real respect for that work would entail.

Second, don't abdicate your obligations as educators to apply normative principles. The existence of standardized achievement test scores does not relieve us of the obligation to have a normative image of what a good classroom, good teacher, and good school ought to look like--an image that goes well beyond what any test can measure. We know what lousy curriculum is like. We know what it's like when kids are sitting and not using their heads at all in classrooms. And if the tests aren't picking up those differences, so much the worse for the tests. We've got to use our collective, practical, professional wisdom even more now than ever before. Education is one of those fields where very often the practice is ahead of the research. Right here in the city of San Francisco there are teachers who are teaching at a level of excellence that exceeds what any of our research models can explain. The last thing in the world I want them to do is stop what they're doing so that they can abide by the principles of effective schooling. Now some of their

work might get even better if they thought about these principles, but not if someone simply slaps a mandate on them.

There's a new book called The Good High School by Sara Lawrence Lightfoot, a good source of data on effective schools. It's an in-depth look at six American high schools: two of them are private elite schools in the East; two are suburban high schools; and two are inner-city schools. The author spent a good deal of time in each of those schools, and she has written a portrait of each. One of the things that just springs out at you is how differently effectiveness is defined at the different schools because they're starting in different places and dealing with different problems. What is appropriate at one isn't appropriate at another. And they aren't just social class differences; they are differences in what is problematic about teaching and schooling in these different settings. But there's another point that Sara Lightfoot makes. She writes about six utterly different institutions and she asks herself, "Is there anything I can find in common about these institutions?" At the end of the book Sara has what she calls her group portrait where she asks what do these places have in common? One of her observations is this:

"Just as the principals in these portraits are seen as more complex and less dominant than their caricatures so too are teachers recognized as bolder and more forceful than their stereotypes would imply. In all six schools I was struck by the centrality and dominance of teachers and by the careful attention given to their needs. To varying degrees the teachers in these schools are recognized as critical educational authorities--the ones who will guide the learning, growth and development of students most closely. Their intimacy with students and the immediacy of their involvement with the substance of schooling puts them in a privileged and special position. In addition, school leaders who are more distant from the daily interactions must depend upon teachers as major interpreters of student behavior and values. They are positioned at the core of education."

A Radical Criterion for Effective Schools

That leads to my last point. I would like to suggest another image for you to carry around in your heads of what an effective school is like--an image that goes beyond the empirical view of a school that produces gains in test scores and goes beyond the Deweyan view of schools as places where children can learn to inquire actively, create knowledge, and participate in a democratic society. I'd like to suggest a view of an effective school that you will treat as outrageous. I think we ought to define effective schools as those that are educative settings for teachers. To put it another way, I will define as ineffective any school that is so organized that the teachers on that faculty cannot be active learners with as much serious support for that role as the students get. Now I know that's

outrageous. I know it's irresponsible. I know that school is a place for kids to learn in, not for teachers to learn in. But I want you to suspend your good judgment for a moment and think about it. We know you can't be smart about everything you need to be smart about the day you enter the classroom for the first time. We also know that there aren't a lot of opportunities to get smarter the way our careers are currently organized. So my question is: If the quality of education for kids ultimately depends on how smart teachers are about their teaching and about their subjects, what better place for them to learn new things than in the school itself?

I ask you to think about two kinds of institutions. First, think for a moment about hospitals, especially our very best hospitals, our teaching hospitals. If you've ever been a patient in a teaching hospital, you have seen doctors come by on rounds. The professor, residents, interns, and medical students gather around the patient's bed, treating the patient as teaching material. This is not always a pleasant experience for the patient, but that is a topic for another day. They're doing this because they view one of the major functions of that hospital is to serve an educative purpose for its staff. The patient is an opportunity for instruction. They have a weekly clinical pathological conference in which a different case is presented for the entire staff of the hospital. During this time the staff isn't taking care of patients; they're meeting together on the job because they have an obligation as an institution to continue the professional development of the members of the institution.

You can justify creating institutions that have as a major purpose the continuing educative value they have for their staff. For example, in the city of Pittsburgh the school board is allocating about a million and a half dollars a year for an institution called the Schenley High School Teacher Center. It is a public high school that was scheduled to be closed. But they decided to keep it open, and they staffed it with fifty teachers drawn from the other eight high schools in the city--teachers who were viewed as very competent by their peers and were interested in being models for other teachers. There are twelve hundred students at the school, and the regular teaching load is three or four classes a day. Over a four year period, every high school teacher in Pittsburgh will rotate through the Schenley School for a period of eight weeks to watch other teachers, to have seminars, to study, to learn, to discuss, to think, to reflect, and then to go back to their home school and apply what they have learned. As each cadre of 50 teachers moves into Schenley from all over the city they are in turn replaced by a group called the replacement teachers, which is the first cadre to have gone through Schenley.

Now the Schenley experiment could possibly fall short because they're pioneering at so many things at once. But it's exciting. It's something that we've got to watch because here is a school system that says we take responsibility for making our school district an educative setting for teachers. My dream is that after four

or five or six years Schenley High School will no longer be the one school in the district where you can go and be educated. But as more and more teachers filter through and go back, they will slowly begin to bring more and more of Schenley back to the remaining Pittsburgh high schools.

It won't happen overnight. Changing the conditions of teaching is a little bit like trying to change the quality of a large lake. It took many years to get it polluted and you're not going to be able to drop a tablet into it and change it overnight--which is why our policymakers, our union leaders, our school administrators have got to have vision. They can't be expecting that quick payoff and the change in test scores tomorrow. Schenley represents what I mean when I say schools and school districts to be called effective must, in addition to what they can do for students, demonstrate that they are educative settings for teachers. I've suggested to some policymakers in Sacramento that whenever anybody passes new legislation about schools, they should attach what I call a Pedogogical Impact Statement. It's like an environmental impact statement except it asks the question what impact is this going to have on the work of the teacher in the classroom: how much more paperwork, how many more students of which kinds with what sorts of trade-offs? A Pedogogical Impact Statement will ensure that as you implement innovations, you do them in a way that makes schools educative settings for teachers. And once they are, I will quarantee that they will have become educative for the pupils and communities they serve as well.

"American schools have not failed. The reason for talking about it is not to be defensive or argumentative. It is to create the conditions necessary for organizational change."

"We need to seek out and implement programs and strategies that will improve excellence and equity. But we have to do that confident of two assumptions: one is that what we do in schools makes a critical difference to the lives of children and young adults, and secondly that what American schools do to affect the lives of children and young adults is the best in the world."

"What teachers look for in these school improvement projects is whether 6 months after the project has started, the superintendent or representatives of the superintendent's staff are still around when the implementation problems start to bear down on individual classrooms and individual schools."

STRATEGIES FOR EFFECTIVE SCHOOL IMPROVEMENT PROGRAMS

David Clark
Professor of Education
Indiana University

I want to change the focus from the teaching research that's been reported to you over the last 24 hours and talk about some of the things we know about effective school improvement programs. But first I too want to reflect on the peculiar situation we find ourselves in at the present time. Americans must be both the most self-assured and confident and the most unsure and insecure people on the face of the earth. After we've experienced decades of industrial and economic success and virtual unchallenged theoretical and practical leadership in the art and science of management, the emergence of an effective international challenge set off shock waves of uncertainty and despair about our ability to manage our businesses and industries and compete in multi-national markets.

Happily for us before we were submerged by Theory Z and quality circles and simply turned over our industrial enterprise to the Japanese, two thoughtful business consultants wrote a best seller observing that American companies with exemplary records of success in the marketplace still existed. They rediscovered some of the elements of genius in America's business and industrial complex and produced a revival of confidence in American business and industry. Later in this talk I will comment more on their findings as they apply to schools and school systems.

The reports that are being issued about education argue that the ability of educationists in the 1980s to respond to what we know makes a difference in schools will be insufficient. That is, we can't do the job. It's not that we don't know how to do the job, or that we don't have the information to do the job. The reports portray American schools as organizations that have failed. That contention is not true. American schools have not failed. The reason for talking about it is not to be defensive or argumentative. It is to create the conditions necessary for organizational change. You are the individuals responsible for managing schools and providing leadership in schools. If you do not have a sense of efficacy about your past efforts, your current efforts and your future potential efforts, you have no more chance of succeeding at your task than students in the classroom who consistently receive negative reinforcement on learning tasks. If you don't believe you can change your schools and your school district, if in fact the assertions of <u>A Nation at Risk</u> are true, if that report correctly portrays the condition of American education, our situation would be hopeless because it is a charge against the persons who are currently managing our schools. Fortunately it's not true. <u>A Nation at Risk</u>

intentionally engaged in hyperbole to make the points that the authors thought were important to bring to our attention.

The challenges that confront American education are numerous, and the demands are going to continue. We need to seek out and implement programs and strategies that will improve excellence and equity. But we have to do that confident of two assumptions: one is that what we do in schools makes a critical difference to the lives of children and young adults, and secondly that what American schools do to affect the lives of children and young adults is the best in the world. We have to have a sense of efficacy.

What Do We Know About School Improvement?

Research on educational change has clarified and specified some of the ingredients necessary for school improvement. As with the effective school, effective school improvement programs are probably best represented as a "syndrome" or "culture" of mutually reinforcing expectations and activities. For the purpose of bringing together the research findings of the school improvement literature, let me offer a set of propositions--statements for discussion.

Proposition 1 - Public schools, individual classrooms, and school systems can and do improve and the factors facilitating school improvement are neither so exotic, unusual, or expensive that they are beyond the grasp of extraordinary leaders in ordinary situations.

The record of success of school improvement programs whether they are local school improvement programs, state school improvement programs, or federal school improvement programs is very good. The federal initiatives worked very well in terms of the amount of money that was put into them over the past 15 or 20 years. One of the myths being perpetrated is that the evaluations of these programs were negative, and that's incorrect. The evaluations of the programs were almost uniformly positive.

Proposition 2 - People matter most in school improvement programs:

(a) Teachers can and will implement new practices and programs given active leadership from building and central office administrators, a chance for planning the implementation process, appropriate training, opportunities for interaction, breathing space to try and fail, and continuous assistance and support.

There are probably no professionals in all human existence that receive as little positive feedback from other adults as classroom teachers. And during a period of school improvement it is terribly important that they be provided with that positive feedback from other adults.

(b) Building level administrators make a difference in school improvement programs by establishing a climate of expectations that teachers will successfully improve practice and by providing on-site coordination, communication, assistance, and support.

(c) District level administrators affect school improvement programs by exhibiting active support in the form of communicated expectations for success, psychological support, needed resources, and local facilitation assistance.

I can tell the district level administrator something about the nature of that support as viewed by teachers. Teachers suspect the district level administrators will provide support during the adoption stage and then they'll stop. As soon as they've convinced enough school people to start working on a project, they'll lose interest in it and they'll be off on something else. And what teachers look for in these school improvement projects is whether 6 months after the project has started, the superintendent or representatives of the superintendent's staff are still around when the implementation problems start to bear down on individual classrooms and individual schools.

(d) External assisters are most effective at the school level providing concrete and practical assistance on implementation issues, i.e., planning, scheduling, problem-solving, follow-through.

Proposition 3 - An innovation is more likely to be adopted and implemented if it is perceived as having relative advantage, compatibility, simplicity, and legitimacy. Implementation is more effective when the innovation focuses on a specific need and demonstrates clarity in purpose and techniques.

Proposition 4 - Specific resources are necessary to support effective school improvement programs:

(a) Staff development programs that are task-specific, and provide on-going, continuous assistance an[illegible]rt.

(b) Monetary resources that are adequate to provide the people and time needed in the program.

The notion that these programs can proceed without external assistance is belied by all the presentations that have been made here. Monetary resources are frequently needed to provide people and time needed in the early stages of the innovation when, for example, teachers need to talk to one another.

Lessons From America's Best Run Schools

Let me turn to a broader literature. Many people at the present time are concerned with the nature of effective organizations. Thomas Peters and Robert Waterman unleashed a blockbuster best seller this year on America's best-run companies, In Search of Excellence. The book is an articulate and relaxed summary of what the authors learned by visiting 35-40 successful companies, serving as consultants for many years to both successful and unsuccessful firms, and reviewing rather carefully contemporary theory and thought about organizations. They began their presentation by noting and commenting very briefly on attributes they asserted characterized excellent companies.

I want to close by noting seven characteristics of effective organizations that I think are also characteristics of effective schools.

1. Commitment. Good schools project a raison d'etre. The school's mission that is asserted by individual staff members may seem imprecise but collectively the staff has arrived at an agreed upon set of behaviors and outcomes that are sufficiently specific to acculturate new organizational members and control the behavior of veteran members. They are organizations with a sense of themselves.

2. Expectations. Good schools and school systems are populated by confident people who expect others to perform to their personal level of quality. The attitude of success crosses categories and feeds on itself. Teachers expect students to achieve. Students know they are expected to achieve and they expect, in turn, to have involved, competent teachers. Principals are surprised by teachers who fail. Teachers are surprised by administrators who ask little of themselves and others.

3. Action. People in good schools do things. They have a bias for action, a proclivity for success, and a sense of opportunism. They plan for now; seize decision options when they arise; try new ideas; drop bad trials; and play within their strengths. Good school systems and schools have learned how to avoid talking new ideas to death. Critics of the

Instructionally Effective Schools (IES) movement pointed to its vague internal structure. Good schools invented a structure and improved their practice. The alternative public schools movement of the late 70s flourished and succeeded because educators in those sites preferred to try new possibilities for success rather than live with old possibilities that had failed.

4. Leadership. The IES literature hammered at the role of the principal as a key factor in school effectiveness. The School Improvement (SI) research singled out the chief school administrator as the key to adoption and her/his staff as critical internal assisters. They are probably both right and incomplete. Peters and Waterman pressed the point that, "innovative companies foster many leaders and many innovators throughout the organization." People with high levels of efficacy and expectancy who are trying and experimenting cannot be restricted to designated leadership positions. Effective educational organizations spawn primary work groups and individual "champions" in unusual numbers. The designated leaderships create an environment for trial and a tolerance for failure so that leaders can emerge and be sustained at all levels of the school system.

5. Focus. Good schools pay attention to the task at hand. Student achievement in the classroom commands the attention of teachers and administrators. More classroom time is allotted to academic learning; more of the allotted time is engaged academic learning time for students. Staff development programs concentrate on classroom-oriented skills and understandings. Good schools know what their core tasks are and focus on those jobs. Like successful companies they "stick to the knitting."

6. Climate. At a minimum, good schools maintain an orderly and safe environment for students and teachers. But they are much more than orderly. Time after time observers report that the organizational climate in successful schools is obvious but hard to specify. Firstly, successful schools work for all the people in the building. They are not schools for students; nor are they schools for teachers and administrators. They work for adults and children and adolescents. The SI literature emphasizes that successful innovations have to fit teacher needs. That sounds selfish. One is inclined to say who cares about teachers if it works for students. The point is you can't have one condition without the other. Good schools are good places to live and work, for everybody.

7. Slack. Good schools have a reasonable level of human resources and slack time. In the IES literature this shows up in an increased number of adults to children in the

> building. In the SI literature the importance of internal and external assisters is emphasized. Both literatures describe the necessity of time for teachers to participate in staff development activity and incorporate new practices into their already crowded professional lives. Good practice is facilitated by a reasonable level of organizational redundancy and slack at the classroom level. Tolerance for failure, encouragement of experimentation, and the capacity to invent and adapt innovations are not achievable in organizational settings where effectiveness is regularly traded off for efficiency.

Do these attributes strike you as ordinary, even unsurprising? We hope so. Ordinary conditions would appear to be attainable. Most American schools are not excellent, just ordinary. Imagine that they could become ordinarily excellent.

"We need to think not only about improving the curriculum, improving the standards, improving our tests, and improving the pedagogical skills of teachers; we also need to think about how we're organized to deliver instruction. We just aren't organized in ways that will enable teachers as individuals or the staff as a whole to help students in every way possible."

"Take a look at what you assume about the organization of time, because with organization of time comes boundaries on opportunity, eligibility, access, etc. Those conditions are the real determinants of student success."

ORGANIZING AND DELIVERING CURRICULUM FOR MAXIMUM IMPACT

William G. Spady
Director
Far West Laboratory for
Educational Research and Development

There's no doubt about it, the National Commission report has captured the attention of the public, the press, and policymakers like no other education document has for a very long time. It has led to the creation of at least one commission on educational improvement in every state, and it has also been followed by report after report after report. But as these other reports came along, the thinking, the focus, the recommendations in them began to differ substantially from the point of view represented in the National Commission's report. That is, while everybody wanted excellence, they had different conceptions of excellence; and while everybody wanted improvement, they had different ideas about what was supposed to happen to the curriculum and the kind of instructional delivery system that it requires.

At Far West Laboratory we decided to write a critical synthesis of all these different reports and to develop some bottom line about what they really say and which of the many recommendations in them we should be paying attention to, based on what we know in the literature and the best theories and practices that are available at the present time. In this book, Excellence in Our Schools: Making It Happen, we have attempted to synthesize nine reports and formulate their recommendations into some kind of concrete plan that local districts and states can use to move school improvement efforts forward. It is not my intention to talk you through all of that today. But I do want to discuss some of the ideas in those reports because they represent some things about the organization of curriculum and the delivery of instruction that may seem pretty radical. They open up some issues and some opportunities for the schools that are very different from just business as usual. It's not a matter of just upping the standards and upping the demands and upping the requirements. There are some recommendations in these reports that have to do with changing the character of schooling and changing the basic definition of teaching roles and responsibilities and administrator roles and responsibilities quite substantially. I'd like to talk about those recommendations and offer some examples of strategies used by three school districts that are responding to this challenge. We'll look at some of the results they've been getting.

Four Messages in the Reports on Excellence in Education

I'd like to begin by summarizing what I feel are four very

FIGURE 1
NINE MAJOR REPORTS

1. Adler - The Paideia Proposal
2. A Nation at Risk
3. Action for Excellence
4. Academic Preparation for College
5. Twentieth Century Fund Task Force
6. Goodlad - A Study of Schooling
7. Sizer - A Study of High Schools
8. Boyer - High School
9. National Science Foundation Board Report

general points that are pretty consistent across all of the reports. That is, there are real differences among the reports, but there are thematically in virtually all of them four very significant things that I think represent some major challenges to instructional managers. And I'd like to make the argument that instructional managers include everybody from the state superintendent to classroom teachers. They are all instructional managers. Earlier today Dave Berliner focused a great deal in his remarks about the nature of decisions that teachers need to make--decisions about time, curriculum, grouping, and allocation of resources in their own classrooms. That's all instructional management (see page 89). Principals need to make similar kinds of instructional management decisions within the building as a whole. It's a matter of simply looking at what your organizational frame of reference is.

FIGURE 2
FOUR MAJOR INSTRUCTIONAL MANAGEMENT NEEDS

1. Elevate traditional definitions of literacy and competence to include higher-order thinking and application skills, and integrate them into the "essential curriculum."

2. Assure that all students acquire these skills consistent with state-of-the-art in instructional delivery.

3. Employ models of instructional delivery that maximize instructional time, staff capabilities, available technologies, dollars and community resources.

4. Evaluate and improve both staff and program effectiveness as essential components of an integrated instructional management strategy.

Now, what are the messages? Message number one is simply that what we have been calling basic skills in the last several years is an inadequate conception of basic skills. It doesn't go far enough. It does not deal with some of the truly essential basics involving higher-order thinking skills, analysis, problem solving, etc. So, one message that the reports all share is that we need to elevate our conception of what we mean by basic skills and change the curriculum focus to ensure that this new conception of the basics is addressed. And I'm not just talking about the subject matters that constitute the basics. We're really talking about the kinds of intellectual skills that are part of those basics.

Second, there is a demand that virtually all students reach those basics. It's not a matter any longer of simply the brightest and the best. As I read it, the charge to the schools in those reports is that all kids need to master the elevated basics. And, that's really what this conference is about. What are those ideas, those practices, and that research which really tells us what type of instructional delivery will make this happen?

The third major message is that the schools are going to need to employ models of instructional delivery that maximize the resources they've got. The fact is, when you look across the United States at what has happened since the reports have come out, there are only two states that have deliberately increased their funding for education despite all the appeals in the reports for greater funding. Fortunately, I think the research tells us we can be doing a far better job with some of the resources we've got than we are now doing. And the reports are very clear about the need for more imaginative, creative use of the resources. We need to try to do both--increase our resource base and make better use of the present resource base.

Fourth, there is a strong message in the reports about the need to improve staff and programs through evaluation. We need to be more accurate and more rigorous in the evaluation of educational personnel. And we need to be equally rigorous with program results. This is a major challenge to building-level administrators to make sure that they have the skills and tools to do the evaluation because the assumption is: we aren't really going to improve unless good evaluation is part of the improvement process.

Toward a Definition of Excellence

So, as I see it, there are at least four substantial points of agreement in the reports. But there is considerable disagreement on other factors, and as I looked at the 800 recommendations in those nine reports, I asked, "What is it that ties these together in terms of a sense of common mission or common definition?" Everyone was arguing for excellence, but a common definition was needed to drive

our analysis of the various reports. We chose to use the definition of excellence in the National Commission's report, A Nation at Risk, as the basis for our analysis.

Let me just remind you of two key components of that definition. The first part pertains to excellence in learning:

> "At the level of the individual learner, excellence means performing on the boundary of individual ability in ways that test and push back personal limits."

It doesn't say excellence is achieving a 1200 composite on the SAT. It doesn't say excellence is getting straight A's in school. It doesn't say excellence is getting admitted to Harvard. It says, that at the level of the individual student, excellence occurs when he or she is being challenged at the threshold of what they can do. That is, it's pushing at their current personal limits.

Number two, excellence for the organization is defined by the National Commission as:

> "That school or college which sets high expectations and goals for all learners; then tries in every way possible to help students reach them."

It is that part of the definition that is clearly most problematic to schools. As I read the definition, and as I thought about the different reports, it seemed to me that the reports appeal to educators to organize and operate in a way that allows them to help students in every way possible. And I'd like to make the argument today that we are organized in a way which prevents us from doing that! We need to think not only about improving the curriculum, improving our standards, improving our tests, and improving the pedagogical skills of teachers; we also need to think about how we're organized to deliver instruction. We just aren't organized in ways that will enable teachers as individuals or the staff as a whole to help students in every way possible.

I took that as a starting point and generated the following definition that I'd like to use as our definition of excellence.

FIGURE 3
A WORKING DEFINITION OF EXCELLENCE

Excellence occurs when the instructional system is able to provide the individual learner with an appropriate level of challenge and a realistic opportunity to succeed on a frequent and continual basis for each instructional goal in the program.

Notice the words that I've underlined: (1) instructional system--we need to think of instruction occurring as a total system, (2) individual learner--the bottom line is the individual learner, not whole classes or whole grade levels of students, (3) appropriate level of challenge--we need opportunities to succeed, and these opportunities need to be frequent and continual. Maybe, in fact, the word should be continuous. They don't happen on a periodic basis; they are present all the time. The final major condition in the definition is that the curriculum and the instructional program need to be built around clear goals. We need to know the purposes for what we're doing and what we're trying to accomplish. Excellence occurs when we can help students succeed in a timely fashion with regard to all of the goals which we have for them in our program. That's the best we can do, and if we do that, we will indeed be excellent.

Excellence in Education: Three Examples

I want to talk about three different school districts where the instructional programs that they use come extremely close to this definition of excellence. And I'd like to share with you some of the results and successes they've had by pursuing and organizing their instructional programs this way.

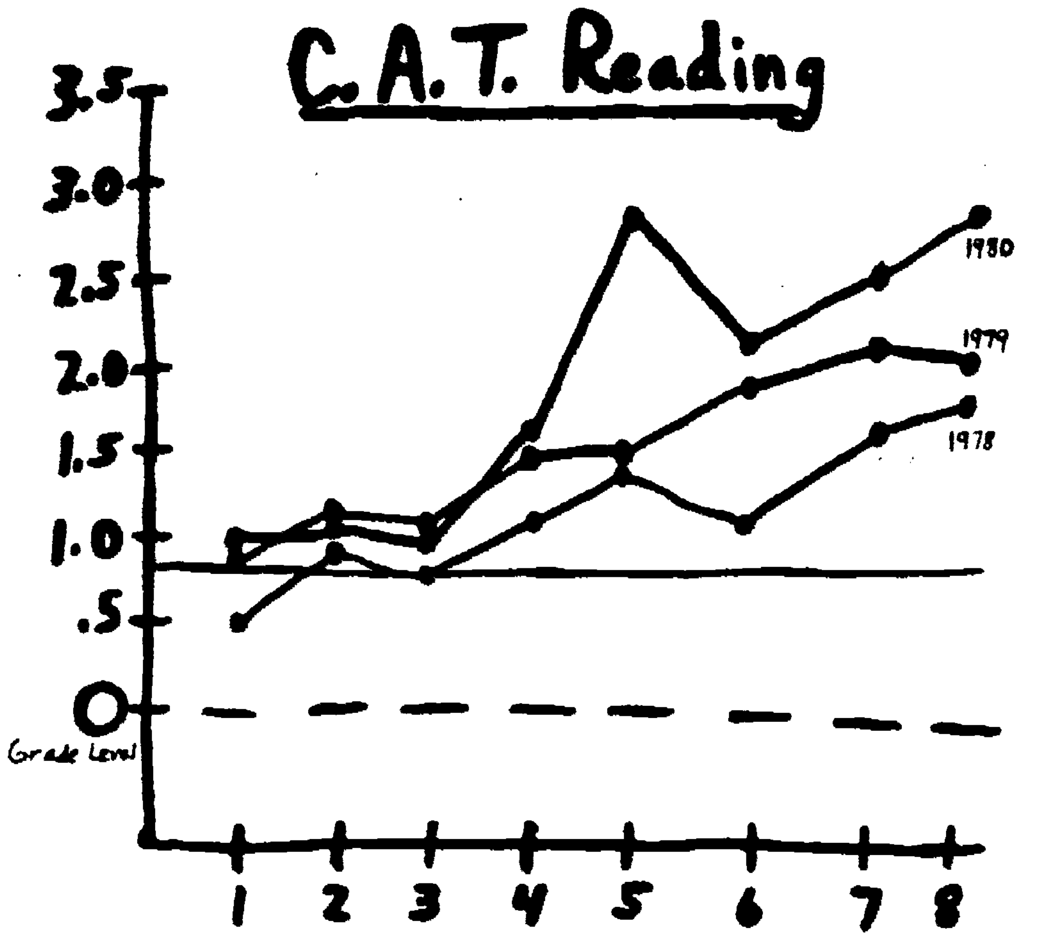
The first district, Johnson City, is a small, blue-collar district in the state of New York. Johnson City began a systematic school improvement program about 12 years ago based on some of Professor Benjamin Bloom's Mastery Learning concepts. The lines in Figure 4 indicate class averages for first grade through eighth grade on the California Achievement Test in reading.

What impressed me about these data was the following: (1) the lines angle upward; that is, there is a cumulative positive effect for students, which means that over time those students are doing better and better in relation to grade level norms; (2) the program is improving in its impact year after year; that is, there is a cumulative beneficial effect the longer they work at this approach; (3) by the time those eighth graders finished school in 1980, the class average on the California Achievement Test in reading was close to 2-1/2 years above grade level. And these are averages; they include all students at the grade level. These results are very impressive, and they are matched by state assessment tests.

Their math results represent a very similar pattern, but they finish even higher (Figure 5). There is some variability between the 1979 line and the 1980 line, but the basic pattern is one of very high achievement for virtually all graduating eighth graders.

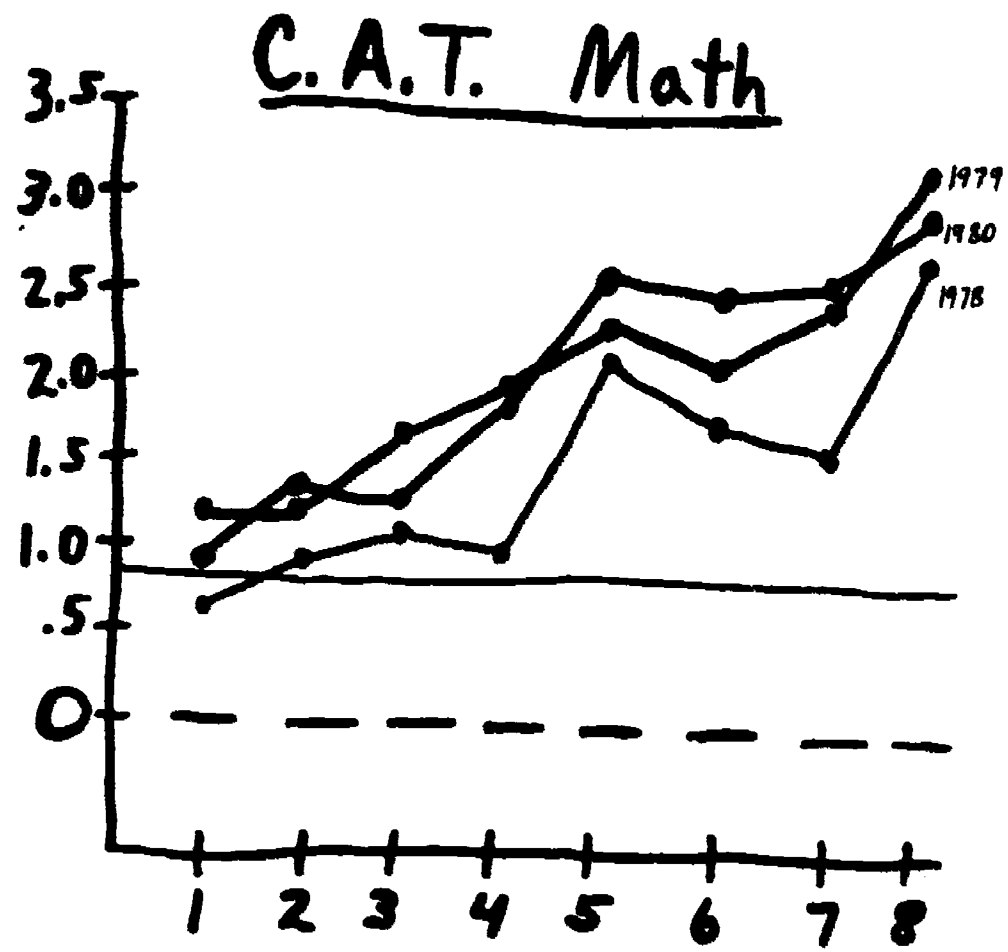
The next district I'd like to show you is Red Bank, New Jersey, a district with a large number of minority students. I'd like you to

FIGURE 4



Johnson City, NY
Up > .5 = 5
No Gain = 1

FIGURE 5



Johnson City, NY
Up > .5 = 6
No Gain = 0

FIGURE 6

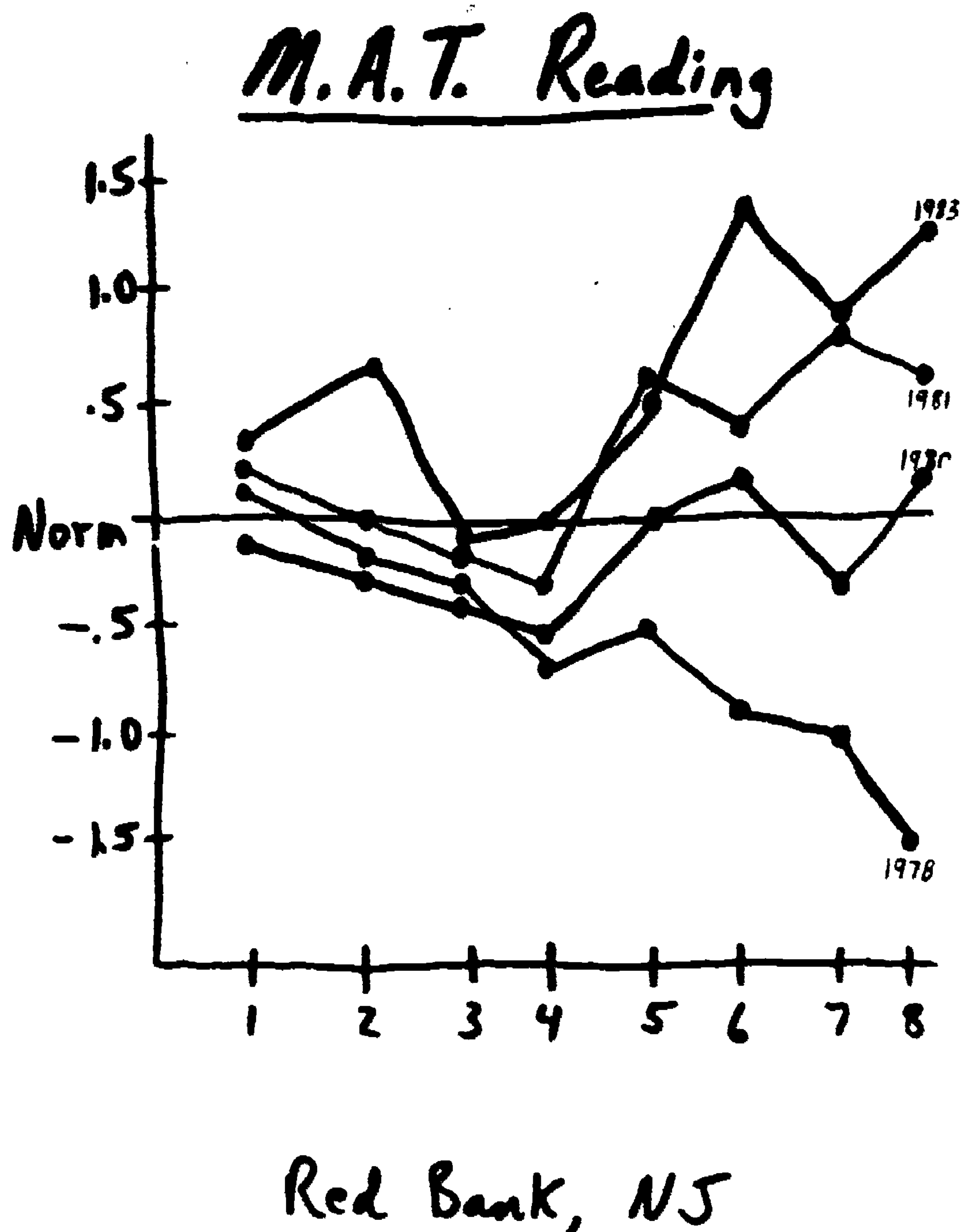
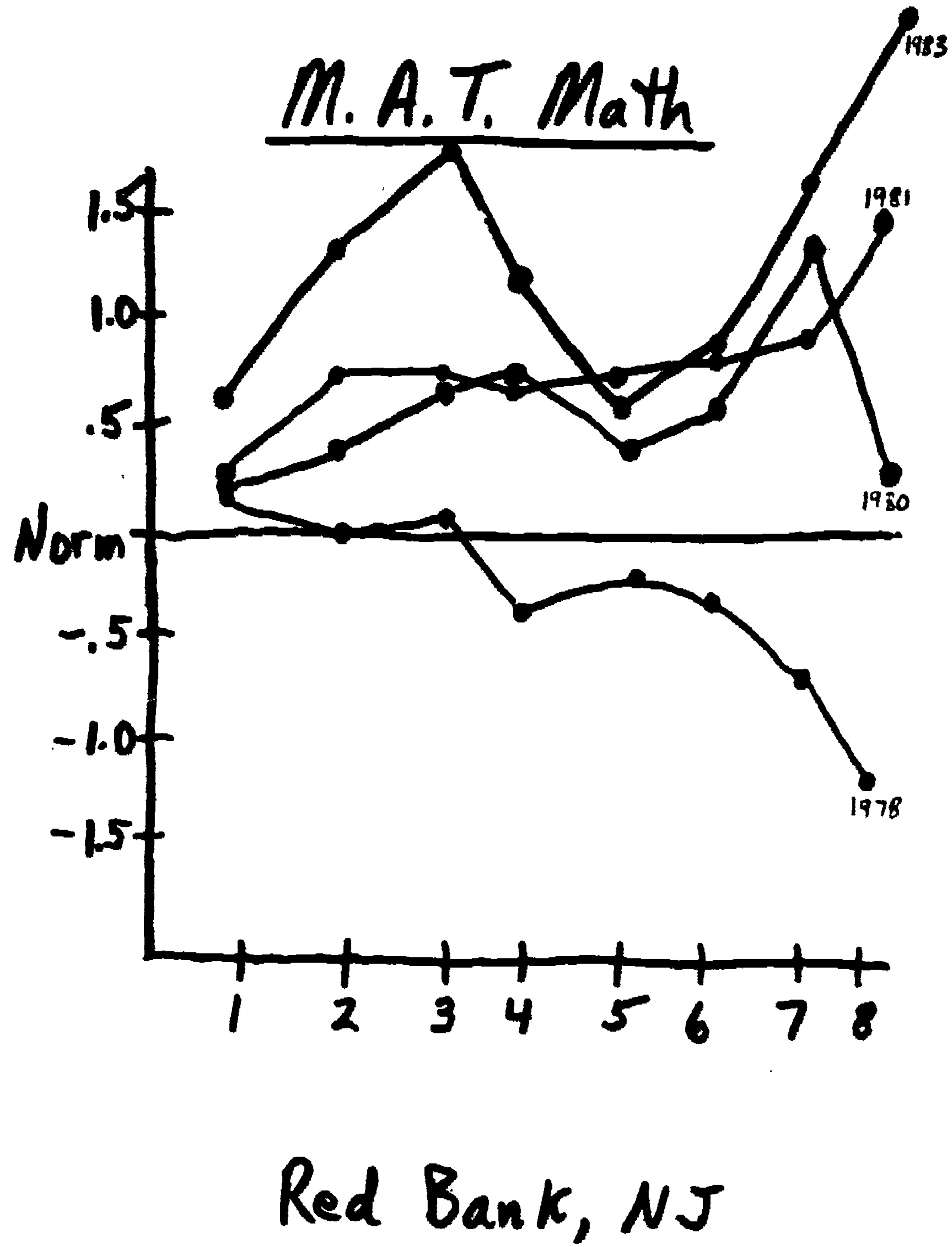


FIGURE 7



focus particularly on the 1978 line. It says that in 1978 the longer the students stayed in that school district the less they learned (Figure 6). That is, things just got worse and worse and worse. Their superintendent, Dr. Joan Abrams said, "These kinds of results are an embarrassment. They do not need to exist. These kids can learn, and we can make the program better so that that happens." Two years later they had risen to the 1980 line. One year after that they had achieved the 1981 line, and two years later they had achieved the 1983 line. So you're looking at a gain over a five-year period in the average achievement scores of three full years in reading. That is, eighth graders were a year and one half below expected norms in 1978, but they're basically a year and one half above expected norms by 1983. That happened because of a very dedicated commitment to the kind of definition of excellence that we've just provided.

The math scores are unbelievable (Figure 7). They show an achievement gain over a five-year period for eighth graders of about four full years. That is almost a grade level per year in the improvement of those students over what the previous graduating class had accomplished. I have not seen a turnaround situation in any school district that matches that. And the interesting thing to me is that this is happening in self-contained classrooms with grade level grouping of the students. It shows what can be done when we get our instructional delivery act together, when we organize curriculum well, and when we give teachers the skills to do better and raise their expectations about the capacity of their students to do better. This was one of the major barriers in the district, the belief that the kids couldn't really handle any more than they already were.

FIGURE 8
CENTER SCHOOL, NEW CANAAN, CONNECTICUT
MATH RESULTS

* About 15% of Sixth Graders finish the first half of Algebra I. Some complete it.
* About 60% of Sixth Graders score 99 percentile on M.A.T.
* About 30% of Fifth Graders score 99 percentile on M.A.T.
* About 2 students in the entire school score below grade level.
* Lowest Sixth Grade score = 6.3
  Lowest Fifth Grade score = 5.9

The third model is a middle class district in New Canaan, Connecticut. These results are average results for the last seven years (Figure 8). This is a K-6 school that has 15% of their 6th graders finish the first half of Algebra I each year. In fact, some of their 6th graders each year complete Algebra I. About 60 percent of their 6th graders every year score at the 99th percentile on the Metropolitan Achievement Test, and about 30 percent of their 5th graders score at the 99th percentile on the Metropolitan. Only two students or fewer each year in the last seven years have scored below grade level for any grade in the school on the Metropolitan, and that includes handicapped students. It is an exciting model, and it is by organizing instructional delivery in the way they do that they are able to get these kinds of results year after year.

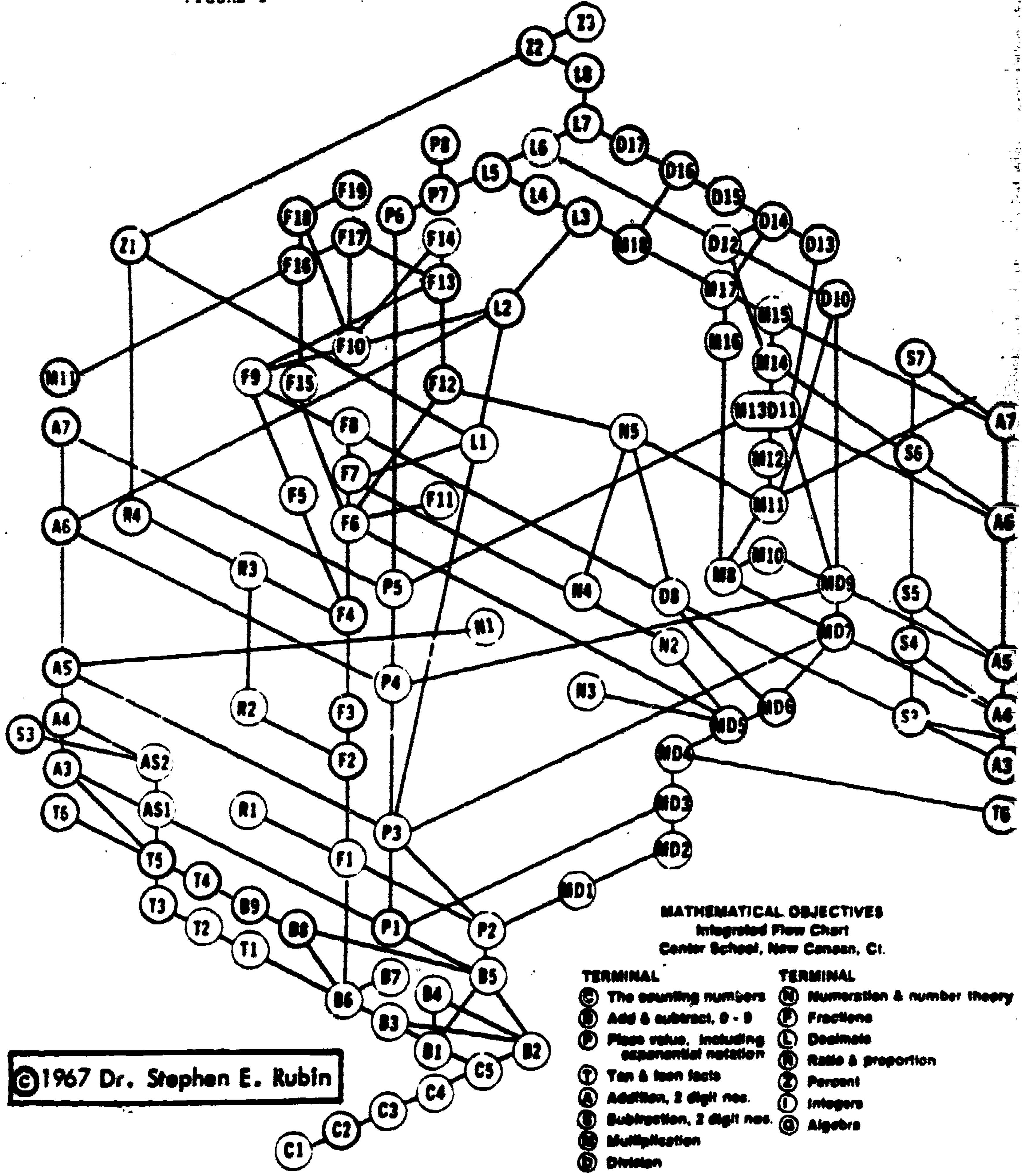
What's fascinating about their delivery program? First, they have a clearly defined hierarchy of math skills that has been validated (Figure 9). This hierarchy, which they developed and tested themselves over a 15-year period, doesn't match the textbooks. That is, the sequence of math skills that they build into the textbooks does not match the real hierarchy of cognitive prerequisites in math learning for their students. Second, they are willing to deliver instruction to any student who needs to move forward on that hierarchy any time they are ready to move forward. And they do that by moving the student to a classroom where that particular level of instruction is going on for as long as they need to be in that classroom. And then they move them to another classroom. On the average, one out of every seven students in the school is reassigned to a new learning group on any given day.

Teachers do no recordkeeping. Teachers do no testing. The teachers only teach. You know who teaches fractions? The fractions specialist in the school is a second grade teacher. She would never be teaching fractions if all she could teach was the second grade curriculum to second grade kids. But she's the best fractions teacher in the school, and anybody who needs to learn fractions goes to her and she teaches fractions. So what we've got is a model where the entire staff shares responsibility for the entire student body and teacher skills are well used.

Notice that Red Bank, New Jersey accomplished something almost as dramatic with their students in self-contained classrooms just by having the teachers themselves do far more rigorous application of skills and attention to the grouping of students. You don't have to go to this incredibly complex model of delivery to get that kind of result.

So what do those three districts have in common besides this definition of excellence? One, a commitment to having virtually all of their students reach the clearly defined goals and standards (Figure 10). Second, they create the context--the climate context and the organizational delivery--for the kids to succeed in reaching those goals. That has required some major changes in all three of

FIGURE 9


MATHEMATICAL OBJECTIVES
Integrated Flow Chart
Center School, New Canaan, Ct.
TERMINAL
Ⓒ The counting numbers
Ⓑ Add & subtract, 0 - 9
Ⓟ Place value, including exponential notation
Ⓣ Ten & teen facts
Ⓐ Addition, 2 digit nos.
Ⓢ Subtraction, 2 digit nos.
Ⓜ Multiplication
Ⓓ Division
TERMINAL
Ⓝ Numeration & number theory
Ⓕ Fractions
Ⓛ Decimals
Ⓡ Ratio & proportion
Ⓩ Percent
Ⓘ Integers
Ⓖ Algebra
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those systems, changes that involve people's beliefs and attitudes about their work ~~and student~~ capabilities as well as changes of an organizational nature (Figure 11). People acquire new skills and use new processes. And this influences changes in procedures and organizational arrangements. They have to change to support those skills being used.

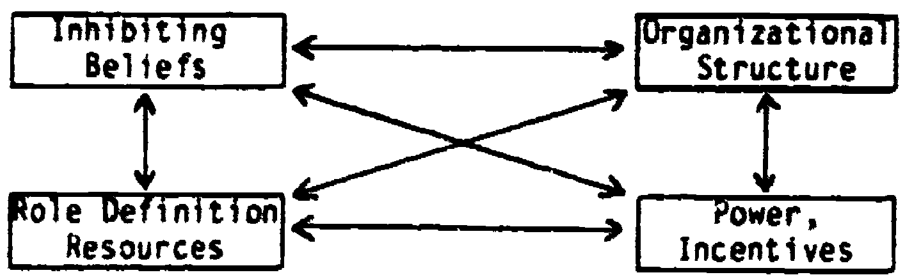
FIGURE 10
TWO FUNDAMENTAL FEATURES

1. Commitment to all students reaching clear standards.
2. Creating the context for them to succeed.

Given the "realities" of educational systems, both imply fundamental changes.

One -- Affective & Attitudinal
Two -- Organizational & Technical

FIGURE 11
KEY ELEMENTS IN THE CHANGE PROCESS



Leadership must accommodate all four!

There's nothing magical about this at all. In each of the three cases, there were three things present: (1) instruction was guided by a clearly defined goal, (2) teaching was clearly directed toward that goal, and (3) students were explicitly assessed on the goal itself (Figure 12). And in all three districts the learning of the students was four or more times greater than would have been predicted by their previous learning, by their previous achievements, by their IQ, or by their socio-economic status. There's an important message there in terms of curriculum organization. It means we need to know not only what we are teaching, but also what we want the kids to be able to do. And it means that our testing needs to be deliberately

organized to directly reflect that. Testing doesn't necessarily mean pencil/paper exercises. In fact, don't use the word "testing" at all. Use the word "assessment." Get away from thinking about testing because testing leads us to thinking about pencil and paper.

FIGURE 12
SUCCESS-ORIENTED INSTRUCTIONAL ALIGNMENT

1. State your goals in operational terms.
2. Teach explicitly to those goals, intending to have all students reach them.
3. Explicitly assess the goals.

"4 to 1" Effective is Routine

S. Alan Cohen
University of San Francisco

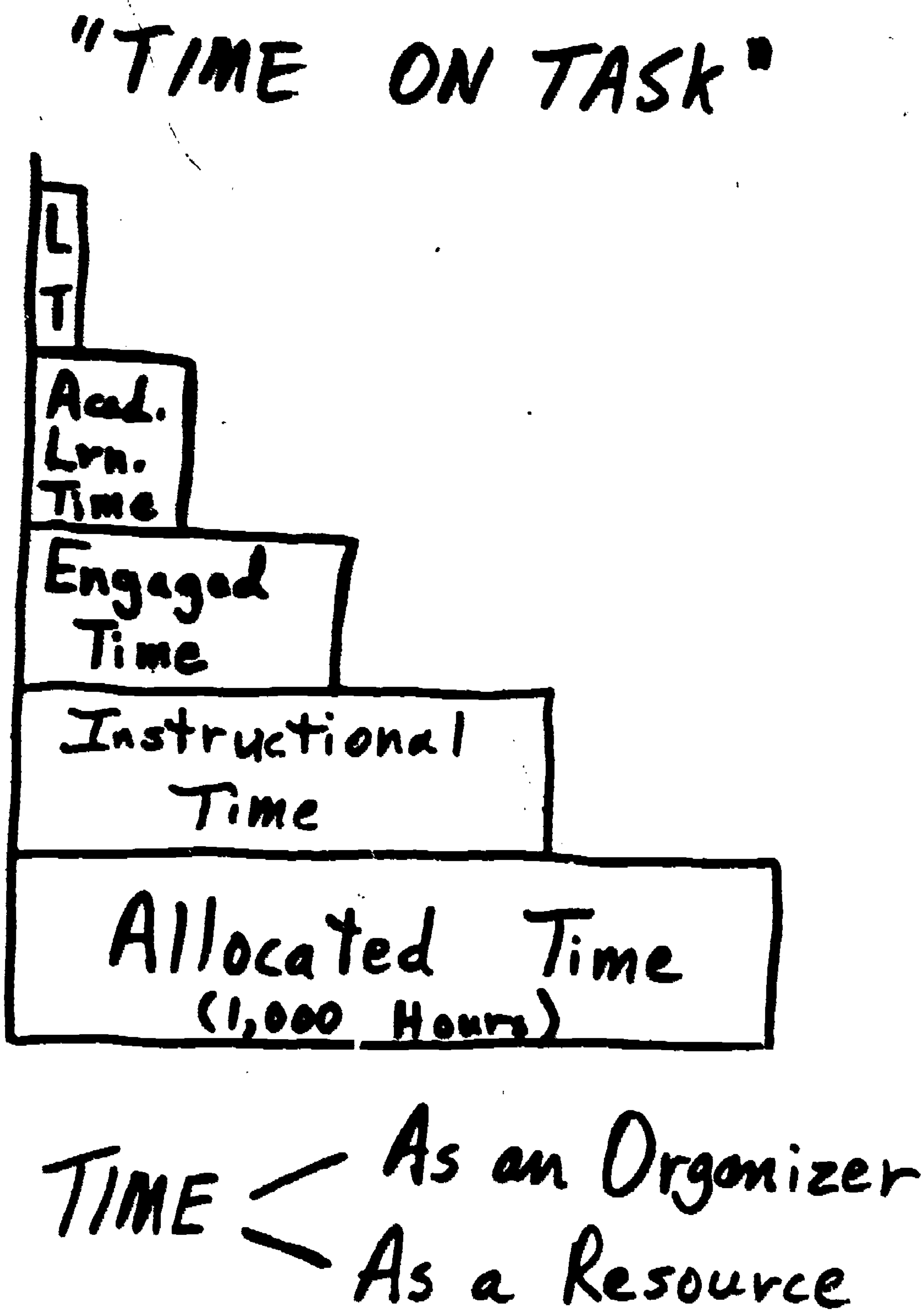
Academic Learning Time is a Key to School Improvement

Let me give you a slightly different look at Academic Learning Time (Figure 13). I'd like you to think about time in two different ways: (1) time is an organizer and (2) time is a resource. School time gives us 1000 hours of potential resource to work with. But how we choose to organize that time and divide it up, and how those divisions of time dictate conditions of opportunity and eligibility for students severely limits the resource usefulness of some of that time.

So think about time as both an organizer and a resource and look at the interplay between the organization of time--class periods, school days, semesters, school year--versus the amount of time we can have available to use inside of those blocks. In allocated time we've got about 1000 hours. Research tells us that the difference between the total amount of time available and the amount of time that we actually have for classroom instruction is limited. We give away recess, lunch hour, bathroom breaks, etc. So, although we started with 1000 hours, the reality is that only a fraction of that is actually going to be available for instructional time. A further reality is that even when teachers do a certain amount of instruction, only a fraction of that amount of time captures the attention and interest of students so that it becomes engaged time.

Let me give you an example of engaged time. Johnny is told to solve 20 math problems. So he solves the 20 math problems and gives them to the teacher and the teacher says, "Great, solve 20 more while the other kids are working on theirs." Now, does Johnny need more engaged time on math problems? Probably not. So simply saying that our goal is to increase engaged time is to miss the point. It isn't

FIGURE 13



"TIME ON TASK"
L T
Acad. Lrn. Time
Engaged Time
Instructional Time
Allocated Time
(1,000 Hours)
TIME
As an Organizer
As a Resource

just increasing engaged time because we can have kids spend lots of time on redundant, unnecessary, unproductive activities. The challenge is increasing Academic Learning Time.

As I view the research, Academic Learning Time involves three major things (Figure 14). First, the kids are working on a clearly defined goal. There is a target there for them to pursue. The teacher has given them an orientation. Second, the teacher's instruction is explicitly directed to that goal. The third element is that they are working on that goal at an appropriate level of difficulty. For them to be working at an appropriate level of difficulty means: (1) that they've got the cognitive prerequisites to be working on that new thing; (2) that they can have a high rate of success in that new challenge; and (3) that they still have a need to reach the goal.

FIGURE 14
ACADEMIC LEARNING TIME

1. Clearly Defined Goal
2. Explicitly Directed Instruction
3. Appropriate Level of Difficulty
   a) Have the Prerequisites
   b) High Rate of Success
   c) Need to Reach Goal

"WINDOW OF OPPORTUNITY"

Increase the Frequency of Windows, Not their Duration!

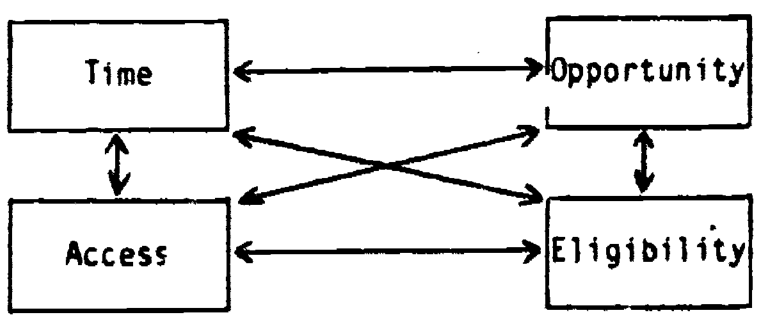
I see Academic Learning Time as representing a window of opportunity. It is the time between the readiness to learn and when learning is completed. That is, it's that period of time it really takes you to learn something. Once you've got it and it is simply a routine thing that you can perform, you'll have a high rate of success but you will no longer be at an appropriate level of challenge.

So the window of opportunity represented by Academic Learning Time is that amount of time that it takes the individual learner to learn the new thing which is his new level of challenge. And once he's completed it, he is ready for a new window of opportunity. And, if our goal is to expand Academic Learning Time, we must increase the frequency of these windows, not their duration. That is, you try to have more and more of these threshold experiences for the kids rather than merely have them do things longer. Because an awful lot of the "doing them longer" is wasted time. It isn't really Academic Learning Time anymore; it's unnecessary reinforcement time.

If you take this notion of window of opportunity and you look at what these schools that we've talked about have achieved, then what it's telling us about curriculum organization is the following: we have to build curriculum around clearly known prerequisites for new learning. That is, if we don't know what leads students to that new threshold, then they'll flounder around in that instructional time. So curriculum organization needs to take this building on prerequisites into account. Certain kinds of learning can be prerequisites for many other things. It's not just a simple linear step up the ladder. The challenge to us is a challenge of using instructional time better. And using the instructional time better means being able to deliver instruction to the students at a time when it benefits them.

As I see it, there is a very direct, immediate, inter-related connection among these four things when we talk about time as an organizer (Figure 15). Time means access, access means opportunity, opportunity means eligibility, eligibility means access, access means time, time means opportunity, opportunity means access, etc. So that our thinking about improving instructional delivery has got to be thinking that forces us to examine the eligibility conditions and opportunity conditions. Have we made it virtually impossible for people to succeed by how we have chosen to organize instruction? What if they don't finish right when the semester is over? What if they need a couple of extra weeks? Well, too bad because that's when we grade.

FIGURE 15
OPPORTUNITY SYSTEM



All of these affect:

1. School Organization
2. Assignment Structure
3. Instructional Delivery
4. Impact of Standards

So, grading, certification, and time are all tied up in this complex set of recommendations. The reports all want us to increase standards, they all want us to improve things. But it seems to me

that when we look at the issue this way, it has an impact on at least these four things. School organization, that is, how the school is organized depends on the decisions we make about these four things. The assignment structure in the school, that is, who works with whom, and for how long, is determined by those four things. Instructional delivery is absolutely determined by those four things. And the impact which standards will have on students' achievements is dependent on those four things.

I'd like to conclude by having you consider that last point (Figure 16). If you're going to raise standards and you don't try to do these other six things, the probability of increasing student failure and frustration is extremely real. You also need to: (1) increase the clarity of your goals so that the students know what it is you want them to succeed at, (2) change the organization of the curriculum, (3) change opportunities to learn; that is, have them be more frequent, more timely, (4) change the quality of instruction, (5) increase opportunities for the students to demonstrate competence other than in a weekly test or a semester's exam, and (6) increase the opportunity for staff communication and collaboration. If these six things are not also included, there is a real danger that raising standards in the name of excellence may, in fact, backfire. One of the first results that happened when the state of Florida implemented its Minimum Competency Testing requirements several years ago was that the dropout rate in Florida's high schools went way up. Raising standards pushed kids out of school. The dropout rate in our schools right now is already alarmingly high, and one of the reasons is that kids are not working at an appropriate level of challenge. In some cases it's too easy, and in other cases it's too hard, too demanding for what they can do.

FIGURE 16

When you raise standards, also increase:

1. Clarity of Goals
2. Organization of Curriculum
3. Opportunities to Learn
4. Quality of Instruction
5. Opportunities to Demonstrate Competence
6. Staff Communication and Collaboration

So raising standards is tied to these six things. And I encourage you as you think about your improvement efforts, as you design your programs, as you think about improving teachers' skills and administrators' skills, to take a look at how things are organized. Take a look at what you assume about the organization of time, because with organization of time comes boundaries on opportunity, eligibility, access, etc. Those conditions are the real determinants of student success.

"Teachers' beliefs that all children can learn is the first half of the educability question. The second half is the teachers' belief that they, both individually and as a faculty, can teach all children."

"This business of testing what is taught can be pilloried as teaching to the test but whether that is bad or not depends on what is being measured and for what purposes. If we want to find out what children have learned in relation to what they have been taught then there must be an 'overlap' or 'alignment' between the content of instruction and of tests."

A DELPHI ANALYSIS OF THE INSTRUCTIONALLY EFFECTIVE SCHOOL

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This Delphi analysis of the "Instructionally Effective School" (IES) was designed first to measure the current state of the art and science of school-based teaching and learning for poor children. Second, it was designed to describe the policy implications of the developmental level for school people, districts, states, and the federal government. After an initial round that defined and delimited the problem, teams of experts in each of the component areas of the IES circulated propositional inventories to the panel membership. Members recorded their opinions about each proposition, the confidence level of their estimates, and where possible the basis on which those judgments had been reached. These data were then re-circulated so that panel members had the opportunity to refine their judgments and comment on the developing consensus and dissensus.

The members are listed below. They were selected because of their expertise in each of the areas and because they were at least favorably disposed to the possibility that instructionally effective schools, according to our definition, did exist. The selection criteria for members are appropriate given the purpose of measuring positive aspects of school practice. This analysis would not have been served by documenting again the widespread belief that schooling cannot work for poor children.

The responsibility for the interpretation in this summary should rest with the authors. The quality of this project is attributable to the hard work and prodigious cooperation of the panel, and they all express their own judgments in the team reports included here. While Judy Lawrence and I did what we could to facilitate the work of the teams with drafting and tentative analysis, our judgments were not part of the panel's opinions. But our opinions are expressed in this summary paper.

Finally, we need to note what should be obvious. Many of the areas and issues discussed in this summary are complicated, some are subtle, many are inadequately established empirically and quite contentious. The analysis done by each of the teams reports expert opinion on these matters. The panel was seldom unanimous and disagreement undoubtedly extends to the current summary, interpretation, and recommendations.

This reports the summary and recommendations, prepared by the principal investigator, of a project sponsored by the School Finance Project of the National Institute of Education. The views expressed here are the author's sole responsibility.

Table 1: Members by Panel and Institution

Team Leader	Team Member
Teachers Characteristics and Behavior	
David Berliner University of Arizona	Leonard Cahen Arizona State University
Administrator Characteristics and Behavior	
David L. Clark Indiana University	Linda Lotto Ohio State University
Student Background and Student Body Composition Variables	
R. Gary Bridge Teachers College, Columbia University	
School Learning Climate	
Lawrence Lezotte Michigan State University	
Pupil Evaluation Procedures	
Donna Wanous Michigan State University	Joy Frechtling Montgomery County Maryland Public Schools
Curriculum	
Ian Westbury University of Illinois at Urbana-Champaign	Lynn Stoll Ontario Institute for the Study of Education
Policy	
Ron Edmonds Michigan State University	Fred Burke Former Commissioner, New Jersey State Department of Education

The Definition Round

The IES should be defined as a school that can increase academic achievement for its students who are from low income backgrounds. It is unfeasible to expect that a school, by itself, can completely erase the relationship between low achievement and low income backgrounds but it is not unreasonable to expect some improvement for these children. How much is enough is a question best answered close to the school. Goal setting should include parents, communities, school boards, and school officials and it should be informed by a sense of the new possibilities for public schooling.

Second, "effectiveness" should be measured by achievement on norm-referenced standardized tests. The panel clearly rejected career or vocational fates of school graduates as a measure of schooling success (for these purposes) and equally clearly rejected a school's reputation or the satisfaction of adults (teachers and/or parents) as a measure of instructional effectiveness. Test scores accurately measure literacy and

numeracy especially at the basic level; while we should all aspire to additional achievements for all children, those things are built on a foundation of basic skills.

Can achievement be changed by manipulating (a) within school variables (b) within existing resources? There is evidence that that is being done: the panel concluded that working on alterable variables within existing resources was a feasible and correct agenda for public schools. This Delphi inquiry was begun to test the notion that there were things within reach of public policy makers which could be changed to help kids do better in school. The proposition has been supported in the analysis although not with the clarity and weight that had been hoped and that may be reached in the future. With respect to money we do not doubt that more support for schooling for poor children would help and that a lot more money would help a lot. But the prospect for that is dim at least in part because people believe that schools are not able to help poor children. Doing better with what we have should contribute to more adequate support. And failing to improve alterable variables within current resources has the unfortunate effect of holding another generation of poor children hostage to a more generous public. Thus, schools should begin moving toward instructional effectiveness because in both the short range and the long range, everyone will benefit.

The panel was nearly unanimous in wanting to augment school effects with help from non-school resources, especially parents. While that is desirable, we believe that the essence of the public policy problem lies with children who do not and will not have those resources. Current trends indicate that within a few years, half the children of the United States will have experienced broken homes yet few principals have the audacity to tell their PTA's that there is not much the school can do to help the children of divorce learn in school. School people ought similarly to accept the challenge of effective education for the children of poverty.

The Delphi was organized around a five-part typology which is becoming commonplace (administrative factors, teacher variables, pupil evaluation, etc.). It is important to note that the framework was both adequate and has become commonplace. We experienced less overlap than expected and with one exception* we found no major area that was inadequately configured. The typology that was used by this analysis is the same as that used by many systems that have tried to bring the IES into practice. That encouraging concurrence between scientific and practical paradigms is further strengthened by the large number of major

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*The composition of a school's student body can be changed by school policies and those changes have an effect on achievement. "Student body composition" had originally been subsumed under "school climate" but was eventually separated.

studies which, independently, have found the same set of variables useful in studying the IES. Even discounting for faddism, that sort of convergence is an important signal in the maturation of a technology. The small number of variables coincides with what school leaders need from the scholarly community---a set of things terse enough to fit on a flag.

As part of the definitional round, the panel was asked to estimate how much each of the factors contributed to instructional effectiveness. Not surprisingly, teacher variables led the way but the last place ranking of specific curriculum materials came as a surprise.

Table 2

Panelists Final Estimates of Percent Contributed by Each of Six Factors to the Instructionally Effective School Summarized by Factors

FACTOR	MEAN	MEDIAN	SD	TOTAL POINTS
1) Teacher characteristics and behavior	25	25	7.2	245
2) Administrator characteristics and behavior	24	25	14.5	243
3) Student body composition*	20	15	19.6	196
4) School learning climate	13	13	6.6	125
5) Pupil evaluation procedures	11	9	8.4	106
6) Curriculum materials	8	10	5.4	75

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*N. B. Numbers 3 and 4 were separated for most but not all of the analysis. Most of the IES literature stresses educating all children who come to the public school regardless of family background. But those features can be varied by some policy makers, e.g., school boards drawing attendance lines and where we needed attention to that sort of phenomenon we moved from five factors to six.

Virtually all of the IES literature puts the role of the school principal first. The panel placed administrator contributions second but when asked which factor was most reasonable as a focus for "government action (e.g., legislation, mandated development, use as a criterion of eligibility for state and federal funding...)", administrators were restored to the top of the list. Principals are more politically vulnerable than are

the heavily-unionized faculties of American schools, and principals are officially charged with school leadership functions; both characteristics make it sensible to concentrate public policy on school administrators, at least initially.

Interaction among the variables may be critical to practice. If for example, one puts in place a finely-grained pupil achievement measurement system, and those data are used inappropriately for teacher personnel evaluations, teachers may withhold their support for a school-wide improvement effort. Must improvement be school-wide? Are teachers or schools a better focus for public policy? These important questions have not been clarified by this analysis for the very good reason that the data base that we might have synthesized about interaction and substitutability among the factors as they have been experienced in the field simply does not yet exist.

Neither is very much known about the instructionally effective secondary school, at least in comparison to what is known about IES elementary schools.* Efforts at school improvement are best concentrated in the early grades because younger children have less of a deficit to overcome and because success there reduces the necessity of costly efforts at remediation later. It is fortuitous that we know more about the more important policy level, elementary schooling.

The definitional round and its iterations (i.e., circulating early results with requests for clarification and comment) did for the panel about what one would hope for in any school system contemplating committing itself to more instructionally effective schooling. The panel agreed that it was realistic to inquire in more detail about schools that were helping poor children achieve better despite their poverty. The panel might have but did not endorse the conventional wisdom about the futility of school effects. Second, the panel agreed on a limited set of factors, those factors stayed stable and they illuminated pivotal questions of schooling practice. Our interpretations and conclusions about each of those areas is discussed next.

Teacher Characteristics and Behavior

The results of this part of the analysis support the idea that more is known, more reliably, about more detailed kinds of behaviors with respect to effective teaching than any other area of the IES. Everyone agrees about the importance of administrative leadership but compared to the specificity of knowledge about good classroom practice, leadership prescriptions

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*It is possible, even likely, that many of our findings would be quite different for the secondary school, e.g., the place of the curriculum. Unfortunately, secondary schools have not had the sort of results-oriented scrutiny that elementary schools have had and thus, a Delphi analysis would be premature.

are counsels of global perfection.

As Berliner-Cahen point out in their report, "Empirical evidence, common sense, and rater judgments all support [the importance of time usage] in the classroom." That means a heavy allocation of time-on-task to direct instruction in reading and math. One effect of that is simply to give students a chance to learn and, where materials are appropriately selected, to succeed.

The second set of items supported by the group's judgment deals with an overlap between what is taught and what is tested. Curriculum mapping and test analysis can both contribute to this alignment. The effect can be increased where teachers pay attention to what has been taught and learned in the child's previous grade ("prior learning" which is in fact a variable).

The panel did not believe that effective teachers would let their teaching be shaped by what they like or dislike. While it is probably true that the most professional teachers are that disciplined, it is also probable that other teachers will need to have strong reasons to adopt unfamiliar techniques. Those reasons have both attitudinal and managerial dimensions.

Another set of items on which there is strong agreement dealt with teacher expectancies about student performance: They were to be high but attainable, modified periodically, and positively reinforced. Norm-referenced standards are supplemented by other criteria and the cyclical relation between learning and its recognition is frequently built in to programmed instruction, mastery learning, and computer assisted instruction.

Several items dealt with the teacher as the "manager" of the classroom and stressed the importance of teachers holding students accountable for assignments, handling problems simultaneously, keeping the pace brisk, and monitoring student seatwork. One way to summarize this is to say that when teachers teach, children learn, and, up to limits which are not now often reached the more teachers teach, the more children learn.

Administrators

We have already remarked on the panel's departure from the conventional wisdom in placing administrators second on the list of rank-ordered contributors to the IES. However, they were first on the list of useful policy targets probably because of a belief that the IES has to start somewhere and be maintained somehow. Administration has always been action at a distance; it has its effect on services through regulations, memos, operating routines, and personnel actions, not directly through teaching children. But is is clear that the panel wants to cut that distance and get principals much closer to children and much deeper into classrooms.

There is a strong feeling that the principal has become too much the business manager and too little the instructional leader. Most members were willing to see the management function done less well, all wanted administrators to do more curriculum development and evaluation, more teacher supervision, more staff development and in general to be far more involved with the school's teaching and learning mission than is now the case. While that is undoubtedly desirable, we think that there are three very real barriers to acting on that advice. First, a generation of principals has come into office with a diminished grasp of instruction. To succeed, one must be a credible, that is a knowledgeable instructional leader. In the IES, administrators do more than preside over the aggregate of what teachers are willing to do. Such schools have a very discrete, concentrated agenda and they have a clearly defined curriculum as has been documented in this analysis. If they are to facilitate and guarantee its implementation (two very different but often complementary functions), principals must first master the content of that curriculum. There are training implications here that should involve districts, institutions of higher education, and professional associations.

Second, teacher unions have "power-equalized" at the building level and principals will have to struggle to assert or reassert an instructional role. Third, one of the chief tools in that struggle is exactly what the panel would have principals de-emphasize---budget control, personnel management, resource allocation, and the administrivia that nonetheless steers organizations. We are encouraged that some principals are leading IES's and in the "real world" of the public school.

Principals of IES's did not have a set of descriptive characteristics that are unobtainable. They were thought to be optimistic people who solved problems and communicated clearly. They were thought to be good at structuring teacher rewards (even in the face of union contracts that have unnecessarily paralyzed some) and they did much more than monitor classroom instruction. The panel was not impressed with the principal as a community relations expert or as a grant getter: neither was a necessary component of the principal's role.

What was necessary was that the principal set high standards, a practice that would depart from the current, probably modal practice in which the principal "protects the teachers" from "unreasonable demands." Knowing what is "reasonable" depends on what is possible. Thus, if the faculty is to believe in the possibility of its work, the school's leaders must first understand the issues and their potential. Schools have been rightly criticized for being adult centered, not child centered. Demanding principals will need political support and courage. The panel helpfully pointed out that a school focussed on basic skills acquisition would have a more reasonable set of goals than the current goal overload and goal

overreach.

Student Body Composition Variables

Student body composition variables caused the most conceptual trouble for the panel but unless that difficulty is overcome, people interested in the IES may miss a source of improvement. The problem lay in having to consider the class status of some children first as a given that defined the IES, but second as a variable, parts of which might be manipulated to children's benefit. The IES may be defined as a school that works for poor children but that does not mean that children from other social classes might not also attend such schools. The IES definition treats family background as a constant, but that same factor is a variable for some policy purposes. This part of the Delphi looked for contextual effects, "To what extent does student body composition...effect an individual student's achievement, ceteris paribus?"

The overall conclusion of this part of the study is melancholy. Those factors most important to achievement are hardest to change; those that are easiest to change are least important. For example, the panel concurred that there are strong effects on achievement for a given child according to the social class of that student's classmates. But school attendance lines cannot be changed by principals. Superintendents, school board members, state officials, (and judges) can alter those lines and for them the social class composition of a school's student body is a policy variable. This finding is one of the few exceptions to the school building focus of the group's policy implications. Here the challenge is above the service delivery level. Interestingly, the same questions about belief and politics will apply for all actors.

The panel believes that big elementary schools diminish achievement (a little), that all girl schools help girls and women develop more of their potential, and (strongly) that homogeneous ability grouping diminishes overall achievement. Of the three, only the latter is clearly within reach of a school principal.

Some parent and family related factors can become school variables. The panel thought there were slight achievement effects from mothers in full-time paid employment and from large families with closely spaced children (probably because of a dilution of parenting "contact time"). Kindergarten is common, some schools have early childhood programs, a few schools have parenting education activities that might contribute to school achievement. Strictly speaking, the scarcity of those latter practices suggests that they are not within-school effects and thus should be excluded from our analysis. Whether that is accepted or not, the examples may make the point that some student body composition variables can be changed to good effect.

The college-going expectations of the parents and children, to take a final example, is thought to be related to achievement and can be shaped, in part, by school process.

In general though, the contextual effects of student body composition are not a major part of the IES. It gets done, if at all, in exactly the fashion that should be characteristic of a public school---with whoever comes to the door.

School Learning Climate

The productivity o. any workplace will be heavily affected by the climate of that place, the way the workers feel about each other, their bosses, and the work itself. The first item on the school climate instrument asserted that in an IES, "The staff (believes) in the educability of all the students served by the school." The panel's unanimous support for the proposition would not be echoed in many schools attended by poor children. There, teachers find themselves expected to be instructors, disciplinarians, clerks, counselors, and supervisors to large groups of children: despite their efforts, many of those teachers believe that they are unfairly criticized and poorly paid. Confronted with a situation they believe to be over demanding and under rewarding, many have retreated into a custodial definition of their work and explained that, at least to themselves, by referring to the research that purports to show how little schools can contribute in the absence of nurturing, intact, educating homes. Thus, what teachers believe about the educability of poor children critically determines how hard they, the teachers will try and through that, how much the children will learn.

Note Bene: How hard it is reasonable for teachers to try is directly related to how effective schooling is at its most powerful. This Delphi study tested that power and while we urge teachers to believe in the educability of all children we have been less successful in amassing compelling empirical evidence of why they should believe that. The conclusion here is not to give up but rather to try harder. The evidence does support substantial increases in the efforts invested by school people. The second conclusion is that teachers and administrators are right to want to know on what basis they are being asked or required to change their practices. We know some good things that work, those should be implemented now, but we also need more research.

Teachers' beliefs that all children can learn is the first half of the educability question. The second half is the teachers' belief that they, both individually and as a faculty, can teach all children. Again, the panel believes that that sort of organizational sense of efficacy is importantly related to increased achievement for poor children. It should be noted that a prior question has to do with the physical safety of the

building which must be secured before either the children or the teachers can attend to schooling. That this is less of a concern than in recent years is due in no small part to the research on school violence supported by the Federal government and its implementation in public schools.

If a school is to have an effect it has to be through more than the efforts of a single outstanding teacher. Children have several teachers over the grades and instruction is supported by the interaction of different roles. As one member put it, to be effective, a school has to be more than "independent classrooms held together by a common parking lot." The panel strongly endorses a shared understanding of the school's purpose and a common effort in that direction. The prevailing norm stresses the "professional autonomy" of individual teachers in individual classrooms. Sixty percent of the panel members supported the proposition that some of the autonomy should give way to a closer integration of the school's work among all teachers.

Climate measures ordinarily look at questions of work satisfaction. While the panel had rejected that as a primary outcome indicator of an IES, it nonetheless stressed "morale," "satisfaction," and "cohesiveness" as important facets of the IES. The group's easy agreement about those things masks real questions about schools where adult satisfaction is adequate and achievement is not, as well as schools where the children's achievement gains have come at the expense of organizational factors such as faculty cohesiveness and principal/staff harmony. Goals set and enforced above a school's current performance may risk the happy climate of a school, at least in the transition from less to more effectiveness.

Much of this is related to leadership in the instructionally effective school. The panel endorses collaborative planning and participatory decision making,* both of which are likely to facilitate the implementation of the substance of the IES. The panel also recommends that administrators sacrifice some of their business management activities in favor of instructional leadership although one wonders what would happen to school climate if the principal neglected to forward payroll vouchers on time.

The IES is an organizational phenomenon as well as an individual one. The school-based culture of teaching must be engaged in this work as well as each teacher's individual estimate of the possibilities of the profession.

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*In the administration data collection, members made the point that leadership might come from the teacher ranks in addition to, sometimes instead of, the administrators.

Pupil Evaluation

The testing practices of American education are not adequate to support an instructionally effective school. The two major dimensions of testing in an IES are instructional tests, often teacher-made, and standardized achievement tests. The Delphi analysis emphasized the importance and contribution of both.

Norm-referenced, nationally distributed, standardized achievement tests, are often criticized but the panel was forthright in recommending them as a metric of achievement within the IES. Assuming that they are reasonably aligned with the curriculum as taught, and assuming that their results are used appropriately, they provide an element of accountability that is more closely related to what children need than are other, more diffuse or adult-centered measures such as satisfaction with the school. If the test performance of children could not be improved by the work of school people, then it would be unfair to evaluate schools with such standards. The uses of test data for policy decisions are discussed in the policy section below. At this point, we should note that the panel supports the formulation of tests by experts and the use of those test data by lay people including school boards and the general community. Moreover, a majority of the panel supports reporting of test data broken down by students' social class. The position is a sensible one. First, the instructionally effective school assumes that effect will be measured and, as long as the IES is defined with respect to social class, those data are relevant. Second, reducing the unfortunate interaction between low social class standing and low school achievement is good public policy. Reporting the data by social class allows us to set and modify our goals. There is a consistent strain in the panel's deliberations to open up "instructionally effective" schools to all children. That recurred here as well where the scores of all children were to be reported but presumably the ones used to judge the IES would be those from poor families only.

One important question was not considered by the panel. Norm referenced standardized tests are designed to cut the test population at midpoint, half above and half below. New York City, Pittsburgh and Atlanta all enroll substantial numbers of minority students, all have been using the same test, and all have had more than half their tested students above the median point for a minimum of two consecutive years. There are three possible conclusions from that. First, some have concluded that some systems are cheating and therefore the results are invalid. Others have concluded that those systems are getting better and should be congratulated. The third possible conclusion is that the results are valid and the norm should be changed. Fragments of all three responses can be found in current policy discussions. Social scientists frequently comment on the social stratification function performed by schools. If the norms are

raised, the political consequences for the important school improvement efforts now underway across the country will be severe.

The group's analysis also emphasized the use of tests in conjunction with classroom instruction. In general, the recommended practice is diagnostic-prescriptive and geared to particular units within the curriculum. Commercial publishers are good sources of tests premised on their curriculum. This business of testing what is taught can be pilloried as teaching to the test but whether that is bad or not depends on what is being measured and for what purposes. If we want to find out what children have learned in relation to what they have been taught then there must be an "overlap" or "alignment" between the content of instruction and of tests.

Some members of the panel were concerned not to overwhelm the teacher with testing obligations; time spent testing is not available for direct instruction. Others were concerned about the cost of testing. Even taking those caveats into account, the frequency and use of instructional testing would be much greater than the current practice of testing at marking periods generally for purposes of placing the child in his or her <u>next</u> class. The emerging maxim is that IES's use the data they collect and thus the consequences of testing impact both what the child and the teacher does next. In that regard, the computer systems necessary to support much more finely grained pupil achievement evaluation systems already exist and are frequently underutilized. The cost to student engaged time is a more realistic barrier to more testing than is the cost of collecting, analyzing, and reporting the data.

Two final points. The panel split on whether or not testing at the level of minimum competency diminished a child's aspirations. The question seems to us to be more relevant to adults speculating about children than to children faced with a series of transitional, ever increasing achievement thresholds. As with the other factors, the panel endorses goal setting close to the child and the local school.

Curriculum Materials

The idea of "curriculum" ordinarily includes both product and process, the texts and how they are used. In order to parcel out the analysis, one team had to concentrate narrowly on the artifacts that mediate, inform, guide, and perhaps determine classroom instruction because those materials are related to general expectations about how much of what should be taught, in what sequences, at what grade levels. Measuring the power or efficacy of existing materials for children from poor families is also important because so much money is invested in their development and purchase. In New York City, for example, half of the State's yearly per pupil textbook allowance in the early

grades is spent on consumable basic literacy materials.

Of the factors contributing to the IES, the panel consistently ranked curriculum materials last. Part of that is attributable to the narrowness of the definition, most is due to the weight given other factors, especially teachers. If one of the major properties of an IES is a diagnostic-prescriptive cycle roughly akin to Mastery Learning, then why would not curriculum support of the 'teacher as evaluator and diagnostician' be fairly central to the IES? The panel consistently stressed relationships and teacher behaviors and just as consistently rejected mechanistic, rational, sequential conceptions of the IES. This will disappoint practitioners who rightly search for recipes but the good news is that, since the contribution of curriculum materials is relatively slight, a majority of the panelists believed that the IES could be achieved whether or not an individual school possessed optimal texts and materials. Similarly, the panel was unimpressed with the effect of alternate curricula on grouping for instruction. Even though the basic skills acquisition research supports direct (reading) instruction to large groups, the panel was indifferent to this part of the question.

The folklore about classroom teaching is split on the extent to which texts control teaching. Text adoptions are thought to have grave consequences because so many teachers plan their lessons from the texts. On the other hand, it is generally believed to be impossible to "teacher proof" any curriculum, that is, to determine the behavior of teachers by having provided text materials and other support. The panel too, was divided. Although materials were not highly ranked, the best of existing curricula nonetheless do support good instruction and do provide some rough outer boundaries for practice. The contribution of materials to an IES comes not from by-passing the teacher directly to the student, but from having affected how teachers teach. The revolution in electronic learning is likely to short circuit that route, a proposition that is tested daily in the video arcades of America. But in the absence of public policies to the contrary, the effect of the electronic revolution will vary by social class. Half the households in the U.S., the top half, will have home computers by 1990.

The panel had been asked to respond to the assertion:

> Text and other materials or products necessary to support the creation and maintenance of an instructionally effective school exist.... There is a basic skills curriculum well enough developed to facilitate the acquisition of word recognition skills, basic spelling, number facts, etc.

The panel's agreement was confident and referenced "Distar," "Open Court," and "Breakthrough to Literacy." Again, the prior focus on literacy was not seen as precluding a later emphasis on

comprehension, writing, or other abilities.

Our own perspective supports the emphasis on the IES as a "people ,lace" but puts more weight on the near term prospective breakthroughs in curriculum. All innovations are partly technical and partly procedural. The recent history of school reform shows more improvement in the process of gaining entry to the school and working with teachers than it does improvement in the content, substance, or product of those changes. As the mature products of curriculum development efforts more accurately reflect the results of basic research on teaching and learning that will change. The factors discussed elsewhere in this report---aligning texts and instruction, maximizing time-on-task and direct instruction, matching teaching styles with learning styles, using diagnostic-prescriptive sequences, etc.---will increasingly be reflected in curriculum materials and to good effect.

Policy

The biggest obstacle to more schools becoming more instructionally effective has to do with attitudes and beliefs about what is possible given the state of the art and science of teaching and learning for poor children. Because of that, the three most important policy implications from this research are as follows.

First, INSTRUCTIONALLY EFFECTIVE SCHOOLS EXIST and can be used as an orientation, a benchmark, a set of aspirations and a source of practical guidance. Pedagogy has changed and is becoming more powerful. Some schools are instructionally effective, more can be.

Second, there is a set of KNOWN FEATURES WHICH PROVIDE USEFUL, OPERATIONAL GUIDANCE to practitioners, policy makers a d researchers. Practitioners and researchers use knowledge in different ways and demand different assurances. Because progress toward the IES rests so heavily on what practitioners believe is possible, the knowledge base of the IES---that is, doing more research--- is unusually important. But, while that is going on, we should all be clear that there are substantive reasons having to do with children's outcomes that make school improvement an urgent priority, now.

Third, INSTRUCTIONALLY EFFECTIVE SCHOOLS CAN BE REALIZED WITHIN EXISTING RESOURCES. While more money would be helpful, it is not necessary. While more autonomy and discretion especially for building principals would be helpful, it is not necessary. Improvements can and should begin now, with what we already have. And the outcomes from those improvements should then translate into more resources for needy schools.

The burden of the policy implications falls unanimously and emphatically on local education authorities and on the school building. Attitudes and beliefs are key to aspirations and school administrators are the paramount audience that needs to understand the IES. Although the panel would probably dissent from our interpretation, we believe that virtually all of the prescriptions in every one of the factor areas (e.g., teaching, pupil achievement evaluation, etc.) require the leadership and involvement of the school principal. Every point in our analysis has implications for the principal.

Our own summary of the major findings, by policy area, follows.

Administrators

(1) Administrators need to re-emphasize instructional leadership probably at the expense of some business management.

(2) They need to set high, child-centered achievement goals and in some locales that will risk the harmony of the school's adult culture.* They will need courage and political support in that.

(3) For instructional leadership to be successful it must be credible and that will require training for practitioners.

Teachers

(4) The knowledge base is best developed here. Teachers should be encouraged by the convergence of research on a limited set of process and product factors linked to the efficacy of their work with children.

(5) That convergence has implications for the traditional autonomy now accorded virtually every teacher in every classroom. In the future, professional practice will have to be selected from a smaller set.

(6) Teachers as faculties are the preferred locus of improvement efforts. While the IES has implications for each teacher as an individual, the IES is an effective organization dealing with children over the course of their school experience.

Organizational Climate

(7) The organizational characteristics of the IES are its task orientation (concentrated nearly exclusively on basic skills acquisition until that is securely in place) and its high expectations of staff and students.

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*Clark and Lotto dissent from this and argue the importance of staff satisfaction as a precursor to student achievement.

Student Body Composition

(8) While the IES by definition enrolls children from poor families, school boards should draw school attendance lines to maximize the contribution which heterogeneous student body populations make to achievement.

Pupil Achievement Testing

(9) Standardized tests are the best overall measure of the IES. They need to be reported by social class, shared widely, and used to guide policy.

(10) Testing linked to instructional units needs to be increased in order to maximize the overlap or alignment between what is taught and what is tested.

(11) Test data used to manage instruction compared to test data used to manage instructors (e.g., ranking less and more effective teachers) are two separate questions. The former makes more difference for realizing the IES than the latter.

Curriculum

(12) Good materials exist although they are not widely recognized. More are being developed but the central finding is that schools and teachers can become instructionally effective with a wide variety of materials.

Finally, for every factor area, and for all policy and practical uses, there is a similar message. The state of the art and science of teaching and learning for poor children is getting better. Because substantial improvements are being increasingly documented, there is reason for educators to return to what brought many of them into the profession in the first place---a desire to help the most needy children.

For further information including the team reports and propositional inventories for each of the IES domains, write:

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CHAPTER 2

PRINCIPALSHIP

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Bruce Barnett & Ginny Lee
Far West Laboratory

"Many legislatures and school boards are telling principals to be strong, programmatic leaders. But the same research from which this prescription derives also says that effective schools grant maximum autonomy to the classroom teacher. How can you be a strong, programmatic leader and grant maximum autonomy?"

"Al' o often we look at classrooms in terms of engaged time and for-
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ha tulated that children should have about a 70 percent success
rate ther words, they should fail 30 percent of the time."

ISSUES FOR SCHOOL IMPROVEMENT

Steve Bossert
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Perhaps one of the most important roles in creating effective schools is that of the school principal. Research has shown that the instructional leadership provided by the building administrator is a key ingredient in school improvement. But many principals are unsure of the most productive ways of exercising their leadership function. Many have turned to the work of the effective school studies--research by Wilbur Brookover, Larry Lezotte, the late Ron Edmonds and others--for indications of characteristics of effective schools. This body of work has identified the characteristics of successful schools.

Successful schools emphasize basic skills. In these schools students exhibit high levels of time on task. The teachers and the principals set high expectations for all students. There is a system of clear instructional objectives. Student progress is monitored frequently to make sure that proper learning environments are created and that students are actually attaining the learning objectives. There is a positive school and classroom climate, and the schools seem to be free from disruption. Also in these schools the old maxim, "effective school, effective principal," seems to ring true.

Effective principals are strong, programmatic leaders who know their teachers' problems and effectively allocate resources to improve classroom instruction. These principals set high academic standards; they maintain student discipline, frequently visit classrooms, and observe teaching. All this sounds like common sense, yet when you think about putting these things into practice in your schools, you will probably find gaps in the research and practice knowledge. The suggestions that come from the effective schools research have a lot of problems both in terms of the research evidence and the practical suggestions for improving instruction in schools.

First, I'd like to discuss some of the problems principals face in trying to implement effective school strategies. Then, I'd like to share with you some of the research that has been going on at Far West Laboratory in the Instructional Management Program. Finally, I will identify some strategies that particularly effective principals have used to improve their schools.

Some Practical Problems for Principals

Let's go back to some of the characteristics that are claimed to typify effective schools. The research says that effective schools have high expectations for their students. How high? Should you set expectations at grade level, above grade level, a little bit below grade level? We know that children have different learning needs, and in fact, many studies have indicated that by setting academic standards too high teachers may actually frustrate many children and depress motivation. So there is a practical problem that teachers and administrators face when they are trying to exercise their leadership role in setting standards. Unfortunately research and practice really set no clear guidelines for how high those expectations should be.

Another characteristic of effective schools is that they seem to emphasize the basic skills. Again, a practical problem--how much of your school program should be devoted to basic skills instruction? Should it be 50%, 75%, 100%? There is no clear recipe for defining the appropriate combination of basic skills and other types of activities within a classroom or school. And in fact, there is some evidence--particularly in the area of math reasoning--that an overreliance on basic skills instruction especially in simple numeracy skills, actually depresses math reasoning. Some of the latest work in cognitive psychology points out that higher-order cognitive skill training can go hand in hand with basic numeracy instruction. I think there is a challenge here for principals and teachers in thinking about the instructional system: what balance of basic skills and higher-order cognitive skills do you really need?

One of the problems in the effective schools research that many principals have expressed to me is a notion that the research presents a dilemma. Many legislatures and school boards are telling principals to be strong, programmatic leaders. But the same research from which this prescription derives also says that effective schools grant maximum autonomy to the classroom teacher. How can you be a strong, programmatic leader and grant maximum autonomy? Clearly there is a balance that needs to be worked out. Many principals that I have been working with have agreed that they should be in the classrooms frequently. Yet they have problems with how to exercise instructional leadership when they have a highly professionalized staff.

My point here is that the research and practice base for effective schools has not yet provided a solid set of prescriptions for school improvement. In fact, there are too many practical problems left unanswered, and I think it is a challenge for you as educators to try to deal with these and not to accept the recommendations that come out of the effective schools research as prescriptions or recipes for your schools.

The Research Contribution: Profiles of Effective Principals

During the last three years at Far West Lab, my colleagues and I in the Instructional Management Program have been trying to attach some answers to those questions. We are far from getting to a place where there are distinct prescriptions. But, what I'd like to share with you today are some of the aspects of effective instructional leadership that have derived from our studies of nearly 20 successful principals from urban, suburban and rural districts throughout the Western States.

First, we found that there was no single formula for the effective principal. In fact, the men and women we studied used very unique and often quite varied techniques for exercising their leadership within the school. There are very important contextual factors such as the composition of the teaching staff, the student body, the community, the district situation, state mandates and the principal's own past experience that seem to shape how the principals accomplish their role (Figure 1).

I'd like to share with you a couple of the models that were generated from the research that we've done with these principals. The way we have worked with principals has been to engage them as collaborators in field research. We use a process of shadowing in which principals are followed by research interns, and their behavior is described. Then through a reflective interview process that occurs over several weeks, and in some cases over an entire school year, we develop models that represent the principals' behavior. The principals like this because many of them have few opportunities to reflect on their own behavior and appreciate having a non-evaluative "pair of eyes" feeding back information about their activities.

The principal in Figure 2 represents the master teacher mode. In his instructional management role, he spent more than half of every day in classrooms working with teachers and pupils in demonstration lessons. He had a very large elementary school, around 850 students. The school is in a suburban community that has a very low socio-economic status and nearly half the teachers were new teachers. He had an assistant principal and was able to rearrange his schedule in such a way that he could spend a large proportion of his time in classrooms. He had a clear conception of the direction he wanted to attain in the school and created an instructional management system that routinely involved issues of planning, monitoring student performance, staff evaluation, staffing, and involving the staff in the personal and learning needs of the students. One thing that was fascinating about this principal--and you can see it in the diagram--is that he didn't separate the notion of school climate from the instructional organization within the school. In other words, whenever he tried to change a climate dimension, for example students' perceptions of themselves or aspirations, he always followed it up with a change in the instructional system. He was convinced that if

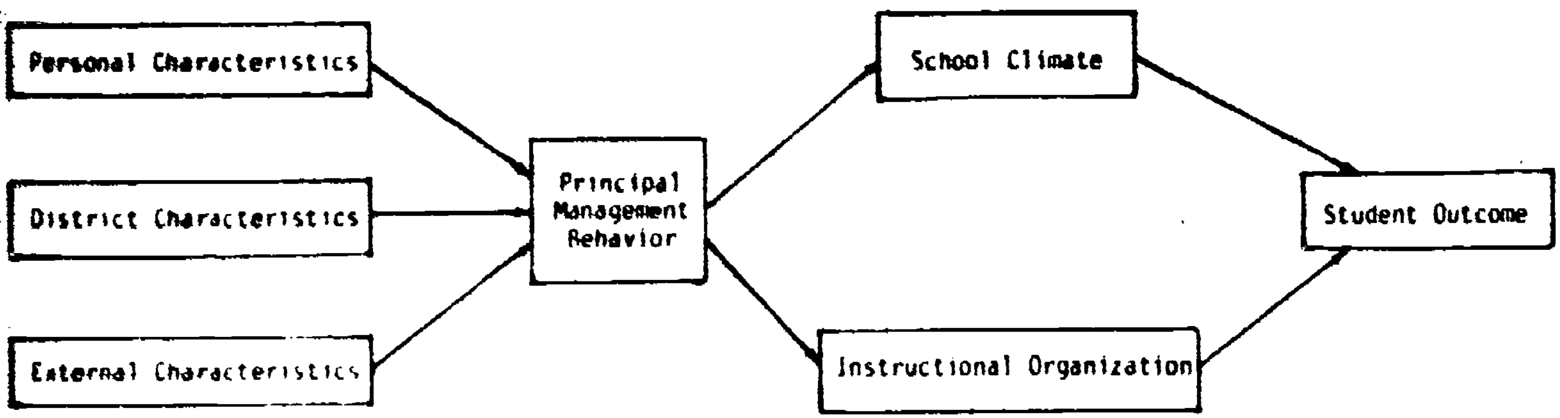

Figure 1: A Framework for Examining Instructional Management

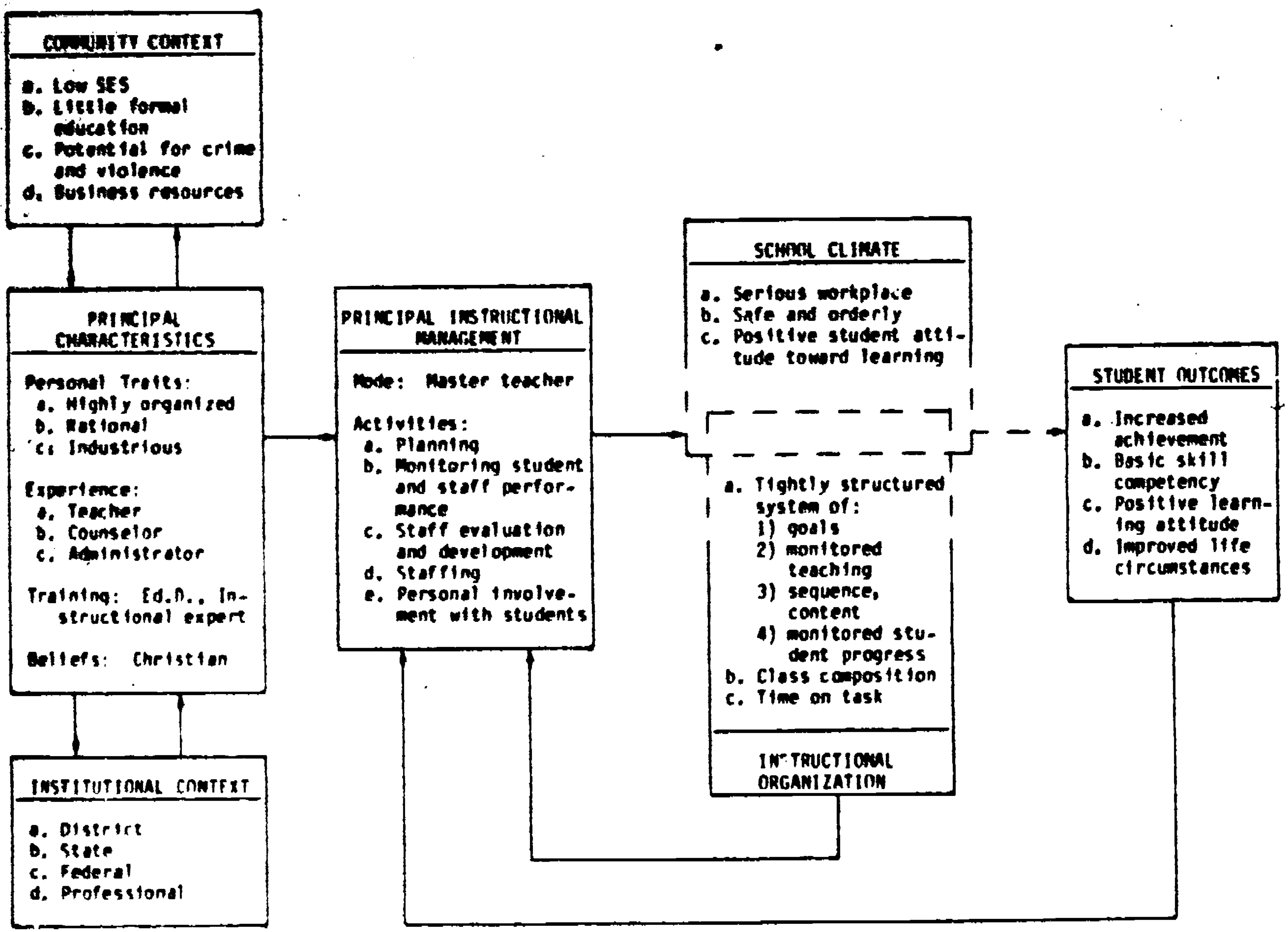

Figure 2: Instructional Management Model - Harold Mann, Field Elementary School

you raised expectations but didn't provide the opportunity for children to demonstrate and practice skills that would allow them to attain those expectations, their motivations would go down. This would lead to a demoralized staff and a demoralized student body. So he always linked changes in the school climate to change within the classrooms in the school. This principal had clear objectives. When we looked at test scores in the school, despite the low socio-economic climate and despite a high turnover rate within the community, the children had rising test scores in reading and math. So it is a very successful school and a very successful principal, held in high esteem by colleagues and by teachers. This principal, in my mind, exemplifies the ideal characteristics that come out of the effective schools research.

Let's examine another principal (Figure 3). This principal spent very little time in the classroom. We characterized his management behavior as primarily indirect. He operated his school by planting an idea with the appropriate teacher and nurturing that idea and watching it spread throughout the school. He had a five year plan to improve instruction, but in the six months that we observed him, he spent a total of an hour and a half doing practice lessons with teachers. He does not follow the clinical supervisor model at all. Another interesting characteristic of this principal was that this man felt that the school climate had to be put in order first, that kids had to be involved in a learning environment school-wide that emphasized achievement, personal merit and self direction. He also felt that the safety of the school was important. Again this is a reasonably large, suburban, elementary school with about 740 children, situated in a depressed economic area. The school itself was in a state of disrepair because of lack of funding. The principal felt that the image of the school had to be promoted by creating a safe and nurturing environment for the children, and only then could he start to make changes in the instructional organization of the school.

These are examples of two different leadership techniques in almost identical schools with students from similar backgrounds. And both schools are equally successful. What made the difference? Well, one key difference in these two schools was that the principal in Figure 3 had no teachers with less than five years of experience. He had a staff which had been at the school over 10 years. The first principal (Figure 2), who was the master teacher, had more than half of his staff as new teachers that year. This makes a very different context for the exercise of instructional leadership. And instructional leadership behavior is contingent upon the context in which the principal operates. We followed this principal (Figure 3) informally the next year to a new school that had about half the staff as new teachers. He then began over the course of the year to look more like the principal in Figure 2. In other words, he had to do much more clinical supervision. He couldn't rely on planting a seed with a key teacher and having it diffuse throughout the school.

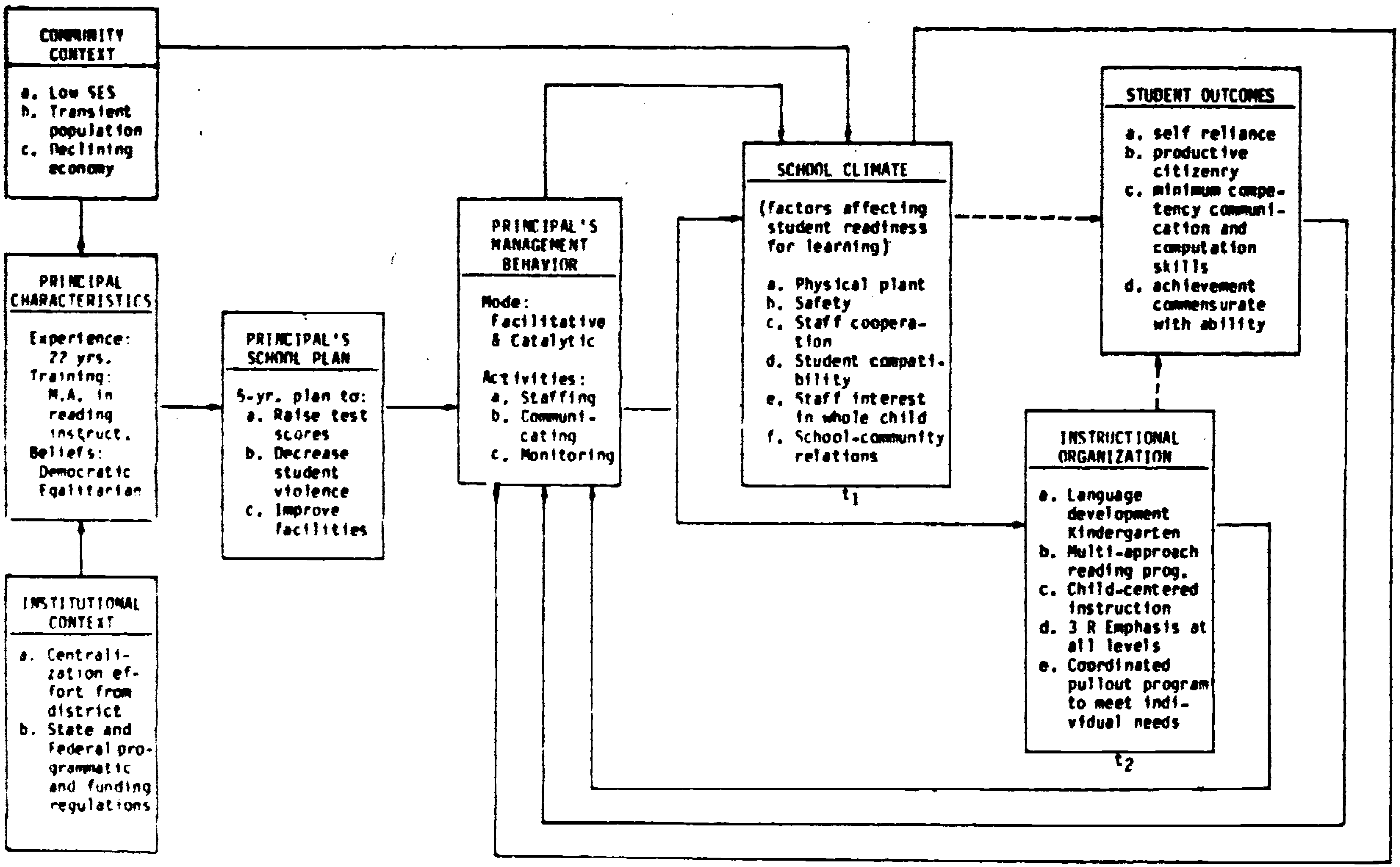

Figure 3: Instructional Management Model - Jeffrey Hudson, McDuffy Elementary School

Instructional Leadership Strategies of Effective Principals

Although different schools seem to require different leadership techniques, we did find some strong commonalities among the principals that we've studied. For example, we found that these successful principals were very active in their schools. The observers who were the shadows for these principals almost had to wear track shoes to keep up with the principals as they moved throughout the school. They were highly visible. A very common technique that these principals used involved getting in touch with kids as they entered the building. For example, the principals commonly met the school buses, and as the kids would come off the bus or as they would walk in the school, they would look at their faces. It was surprising how often the principal could anticipate problems within the school on the basis of how the kids came into school.

Another thing about these principals was that they were very systematic in their behavior and systematic about moving through the school. As we cataloged their behavior, every one of these successful principals visited every subsetting within the school--library, hallways, recess, lunch--every day or every two days. In fact one of our principals was so systematic that he had a little matrix of his school on a three by five card. He checked it off as he touched base with different people.

These are two key aspects of their instructional leadership role, but perhaps the most striking characteristic of these successful principals was their conception of instruction. All of them had a clear conception of effective instruction, and this conception guided their decisions throughout the day and throughout the year. Every decision, policy, practice within their schools was linked to improving the learning opportunities of children. They were truly concerned with quality instruction, and it was manifested in even the mundane tasks that principals engage in--from scheduling school assemblies, to collecting milk money, to dealing with disruptive students. These principals always ask themselves, "How will my decision affect the children?" We found that less effective principals often ask this same question. But the truly effective principals--the most successful ones that we've observed--could describe their strategies and actions in terms of solid principles of good instruction. They could tie it back to key features of effective instructional practice.

In our interviews and observations of these principals, we found that their models of good instruction are really quite consistent with the work that's beginning to emerge from the last five years of effective teaching research. Although the principals did not use these terms, they seemed to describe the instructional system in their schools along the six dimensions or six factors that are seen as important for constructing an instructional program at the classroom level and at the school level. One of the most important is time on task. These principals understood the conception of time on

task. Time simply didn't mean allocating time for instruction, it meant making sure that kids were engaged in the instructional activity and that they were successful at the instructional activity. All too often we look at classrooms in terms of engaged time and forget the kids may be working on tasks they can never accomplish. I was amazed when I looked through old curriculum development texts, even some of those written within the last five years, that have postulated that children should have about a 70% success rate. In other words, on their worksheets, tests, and the like, they should fail about 30% of the time. But there is a growing amount of evidence that success rates around 90% to 95% are the best. They move kids ahead rapidly. So, time on task is not simply a matter of getting enough time; it's using it in quality manner.

Class size and composition are important factors. Most of you probably are aware that class size alone is not a good predictor of student achievement. But these principals use size in various ways to construct classrooms that were appropriate to given activities and given tasks. At the elementary level the difference between 25 and 28 children in a classroom probably would not make a big achievement difference. It may help teachers to overcome some behavior problems, but it probably will not have a demonstrated effect on student achievement. However, for particular aspects of instruction and for children with particular reading or mathematics problems, smaller groups are appropriate. In the successful schools we saw a lot of cross-grade, flexible grouping for particular instructional objectives. The teachers were important in constructing this, but the principals in these schools played a key role in monitoring the curriculum and making sure that the experiences were high quality and well-articulated with the overall goals of the school. In other words, the instructional leadership role of the principal was to tie the different groupings together. Grouping practices within the schools seemed very important--from tracking at the high school level to in-class grouping at the elementary level. The principals were involved in helping teachers develop strategies for effective group management.

There seems to be a growing sense in education today that the techniques of direct instruction, whole class teaching, or active teaching are better for teaching the basic skills than small group instruction. Well, that may be true. But we found that an overuse of direct instruction in the classroom seems to depress higher-order cognitive skills. All the successful principals that we've encountered are grappling with the problem of how to provide good solid basic skills instruction and also provide opportunities for children to acquire these higher order cognitive skills.

In addition to grouping, another characteristic, the activity or task structure within the school, seems to be an important realm for good instructional leadership. Often times in the elementary level, when teachers work within grade teams, the overall structure of the curriculum within the school can get lost. Let me give you an

example. A number of years ago, I was working with a school that had as a primary goal the creation of self-directed learners. They wanted the children who left in 6th grade to have some skills that would allow them to enter the curriculum of a junior high, make good decisions and be self-motivated and self-directed learners. But the junior high school teachers complained that the students from that school were really very dependent learners. We analyzed the instructional program in the school and found that each grade level had very good instructional materials. We also found that in kindergarten through the end of third grade the students experienced a lot of choice in their instructional activities. They often chose the time in which to work certain activities and had the responsibility to get their materials completed. By fifth and sixth grade, the teachers were primarily using worksheets and simple cognitive tasks, recitation and the like. The students had almost no chance to exercise the self-directed learning skills that they picked up in the early grades. The principal would be the key person in this school to help articulate the curriculum and the school goals across all grade levels. We found this to be true in the twenty successful schools that we've been studying. These principals played the key role in the articulation of the curriculum and linking the school-wide objectives to the particular learning experiences that children have in those schools.

These successful principals also were concerned with other factors that typify effective instruction--things like the pacing and sequencing of instruction within the classroom. At the elementary level, the number of new words per day introduced in the reading lesson can vary from 1.8 new words a day to 5.6 new words a day. In correlating the achievement gains of the children, there seems to be some evidence that children who encounter 5.6 new words a day achieve at a much higher rate. Their achievement gains are significantly higher than children who receive only 1.8 new words a day. The more exposure, the better. Looking back to time on task, there is good evidence to indicate that as you increase time on task you also have to increase material density or kids get bored.

Many teachers and principals don't realize the intertwining of different effects in the instructional system within the school. The effective principals that we've been studying, as well as the effective teachers that we've worked with over the last five or six years, seem to understand how these different factors intertwine to shape the instructional system. And these successful principals have played an active role in facilitating good learning opportunities along these dimensions.

The last dimension that seems to be of central concern to these instructional leaders is the evaluation system within the school. One of the key features of good instruction seems to be prompt feedback to students. And, all too often as we've observed in many classrooms, the quality of materials is good, the quality of interaction between teacher and pupils is good, but when homework is

assigned or when class assignments are given, there is often too big of a lag between the feedback the children get and their actual performance on the task. What we've found in looking at these successful principals is that many of them have created school-wide standards for evaluation. For example, in several of the schools there is a school-wide homework policy. Part of that policy mandates timely feedback to students, and the principal is actively engaged in monitoring the quality as well as the timeliness of teachers' responses to students. At the secondary level, the principal's instructional leadership role may be in monitoring department chairmen who are actively involved in the evaluation system within their department. But in all cases we've found that the principals have been active in establishing clear standards for the evaluation of teachers and pupils.

When I work with principals in groups of 25 to 50 we often spend a half day to a day talking about the instructional systems in their schools and developing profiles like the two I have shared with you. Principals often don't have the opportunity to reflect on their instructional leadership roles in the school and the various factors that shape what they can do and how they can accomplish their goals. We've just begun to work with a number of principals in Sacramento and in Salt Lake City to teach shadowing and reflective interview techniques so that peers can observe each other, interview each other and help construct their own models that help for school improvement. We find this is a useful staff development task.

Summary

I'd like to summarize a couple of issues. In our study of effective principals we find that there is no single way for a principal to exercise instructional leadership. Everyone cannot be a master teacher, and not every school should have a high amount of clinical supervision. Sometimes it's not possible and many times it's not desirable, depending on the type of student body and the type of staffing characteristics.

But it is clear that successful principals have a solid conception of good instruction and that their conception revolves around the six or seven key features of instruction that I talked about: time on task, class size and composition characteristics, the task and activity structures in school, curriculum pacing and sequencing, and evaluation. These are key factors that all of these principals have addressed in terms of their general school-wide programs.

The other striking thing about these principals is that they use very mundane actions as the opportunity to express their instructional goals and foster excellence within their school. So if there is a punchline for my talk today, it's something like this: Instructional leadership does not necessarily mean doing something new, but perhaps it means doing things in a new way. Most of you have the

elements of effective schools already present in your schools, and instructional leadership, then means knowing how to put them together i to a school-wide program that ensures positive learning experiences for all children.

"It is clear from the research that we have been doing that the principal is important, that different change facilitator styles can be identified and described, and that the day-to-day behaviors of principals can be sorted in terms of those that appear to be more useful and helpful in implementation. It also is clear that the principal should not be considered in isolation from his or her colleagues and other aspects of the school setting."

"On any single dimension one particular style may look good. However, if the criterion for success is shifted then another style may seem to be more appropriate. The implication for all of us that are involved in research, evaluation, training, policy development and the monitoring of implementation is that the criterion for success that is being considered must be carefully thought out. Further, no one style is likely to be perfect for all situations."

THREE PRINCIPAL STYLES OF FACILITATING SCHOOL IMPROVEMENT*

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In the last several years as national, regional and local attention has increasingly focused on school improvement, and school effectiveness, the principal has once again become the center of attention. National commissions, superintendents, school boards and others are charging principals with responsibility and accountability for improvement and increased effectiveness within their schools.

At the same time, policymakers and researchers are again examining the leadership characteristics of principals. There has been an enormous amount of effort put into studying the role of the principal especially in the elementary schools. For thirty years now the research has emphasized that the principal is important. The various ways that principals spend their time have been described and their theoretical models have been developed to describe the different leadership styles that principals and other leaders can use. Yet, the detail of what principals should do on a day-to-day basis as they facilitate implementation has not been as clearly specified.

In recent studies at the Research and Development Center for Teacher Education, the details of the principal's role in facilitating school improvement has been studied. A series of studies have been conducted in which the principal's "Change Facilitating Style" has been examined. The particular change facilitating styles being studied were derived from earlier research on implementation of innovations at the classroom level. That is, these descriptions of principal style have not come from theory, but rather from observation of principal practice and the consequent effects that their practice has had upon implementation at the classroom level.

In this presentation three different Change Facilitator Styles, Responder, Manager and Initiator, that have been the subject of study by staff of the R&D Center for Teacher Education are described. The related research is briefly abstracted and implications of these three change facilitator styles for principal training, the planning

* The research described was conducted under contract with the National Institute of Education. The opinions expressed are those of the author and do not necessarily reflect the position or policy of the National Institute of Education. No endorsement by the National Institute of Education should be inferred.

of implementation efforts and the monitoring of school improvement and school effectiveness efforts are discussed.

The Principal as Change Facilitator

That principals make a difference in the functioning of schools seems fairly obvious. The traditional research and theory building around leadership, leadership styles, educational administration, change and industrial psychology have suggested overall strategies and conceptual frameworks that could be used to analyze the role and functioning of the principal. However, the extensive research and literature that is available has been slow in identifying specific behaviors that principals can do that will make a difference. More recently research findings from the school effectiveness studies have included descriptions of behaviors of principals that were found in the more effective schools (Edmonds, 1979; Leithwood & Montgomery, 1982).

The research that is described here focused upon the role of the principal in a very specific context, that of facilitating teachers' use of new instructional programs. Rather than attempting to look at the broad array of activities and roles of the principal, the emphasis was placed specifically upon what principals do in relation to curriculum implementation. Thus, it has been possible to conceptualize more clearly what is meant about style, by relating it specifically to change facilitation and further, it has been possible to distinguish between an overall gestalt of a principal's style (Rutherford, Hord, Huling & Hall, 1983) and individual behaviors that a principal takes from moment to moment in relation to implementation. These differences in assumptions and framework have resulted in a set of research studies and findings that clearly have implication for practice, training, planning future implementation efforts and future research studies.

The change facilitating styles that are described in more detail below were initially derived out of secondary analysis of an implementation effort that encompassed eighty elementary schools in one large suburban school district. The innovation was a revised science curriculum that was being implemented by teachers in grades 3-6. The district had provided the same level of inservice, material support and consultation to teachers as they were involved in implementation.

In the study that was being conducted at that time, teachers' Stages of Concern about the innovation and their Level of Use of the science materials were systematically assessed in twenty study schools. One clear finding from that study was that in some schools implementation moved more easily with more refined use of the science program than had occurred in other schools. These schools appeared to be similar in terms of demographics, financial resources, and the outside staff development support that had been available. The only difference that could be systematically identified between the

schools had to do with characteristics of the principal and what the principals had done in relation to facilitating their teachers' use of the revised science curriculum.

A secondary analysis of these data (Hall, Hord & Griffin, 1980), led to the hypothesis that the degree of implementation varied in each of these schools based upon the concerns and intervention behaviors of the school principals. Further, it was hypothesized that there were apparent patterns of behaviors that each of the principals used that could be summarized and appeared to be stereotypic of particular styles.

In two subsequent studies these emerging change facilitator styles became the focus of study. The outcomes have included clarification of these three change facilitator styles, more detailed descriptions of them and development of a related conceptual framework about the role of the principal in facilitating implementation.

The paragraph definitions for each of these change facilitator styles are included as Figure 1. It should be noted that other styles clearly exist. These three, Responder, Manager and Initiator, have been the focus of concentrated study. These change facilitating styles have been observed in principals who are working in schools that were considered to be successful and where implementation has occurred. It is quite likely that in schools where implementation had failed or had been drastically altered from the desired course that other principal styles would be found. One can also imagine several other styles that principals could employ.

Clearly any one principal could lie on a continuum from being more of a Responder, to more of a Manager, to more of an Initiator. At the extreme ends other styles could be imagined including the despot and a laissez-faire style. Many principals will not represent pure styles, but some principals do appear to follow fairly closely the different styles described in Figure 1. Some of these principals were selected to assist in the third principal study. What is being suggested here is three different change facilitator styles that principals may represent to a more or less degree.

The Principal-Teacher Interaction Study

In the most recent study of principal change facilitator style, nine elementary school principals in three different school districts and their staffs were selected for study. These principals and their staffs were involved in implementation of curriculum innovations. Each school district was in a different year of implementation. The three schools in one school district were involved in their first year of implementation of a writing curriculum The second school district was involved in the second year of implementation of a unified math curriculum. The third school district was in the third year of district-wide implementation of a revised science curriculum.

FIGURE 1
DESCRIPTIONS OF THREE CHANGE FACILITATOR STYLES

Initiators have clear, decisive long-range policies and goals that transcend but include implementation of the current innovation. They tend to have very strong beliefs about what good schools and teaching should be like and work intensely to attain this vision. Decisions are made in relation to their goals for the school and in terms of what they believe to be best for students, which is based on current knowledge of classroom practice. Initiators have strong expectations for students, teachers and themselves. They convey and monitor these expectations through frequent contacts with teachers and clear explication of how the school is to operate and how teachers are to teach. When they feel it is in the best interest of their school, particularly the students, Initiators will seek changes in district programs or policies or they will reinterpret them to suit the needs of the school. Initiators will be adamant but not unkind, they solicit input from staff and then decisions are made in terms of the goals of the school, even if some are ruffled by their directness and high expectations.

Managers represent a broader range of behaviors. They demonstrate both responsive behaviors in answer to situations or people and they also initiate actions in support of the change effort. The variations in their behavior seem to be linked to their rapport with teachers and central office staff as well as how well they understand and buy into a particular change effort. Managers work without fanfare to provide basic support to facilitate teachers' use of an innovation. They keep teachers informed about decisions and are sensitive to teacher needs. They will defend their teachers from what are perceived as excessive demands. When they learn that the central office wants something to happen in their school they then become very involved with their teachers in making it happen. Yet, they do not typically initiate attempts to move beyond the basics of what is imposed.

Responders place heavy emphasis on allowing teachers and others the opportunity to take the lead. They believe their primary role is to maintain a smooth running school by focusing on traditional administrative tasks, keeping teachers content and treating students well. They view teachers as strong professionals who are able to carry out their instructional role with little guidance. Responders emphasize the personal side of their relationships with teachers and others. Before they make decisions they often give everyone an opportunity to have input so as to weigh their feelings or to allow others to make the decision. A related characteristic is the tendency toward making decisions in terms of immediate circumstances rather than in terms of longer range instructional or school goals. This seems to be due in part to their desire to please others and in part to their more limited vision of how their school and staff should change in the future.

Hall, G.E., Rutherford, W.L., Hord, S.M. & Huling, L.L. The principal as facilitator of school improvement: Findings from recent research. Paper submitted to Educational Leadership, September 1983.

In each district principals were asked to participate based on their overall change facilitating style. Using researcher supplied descriptions, key central office administrators made recommendations for principals and schools to be involved in the study. Then the principal and their teachers were approached to see if they would be willing to allow the researchers to document the interventions that principals made and to document implementation at the classroom level as it was occurring.

Again it should be emphasized that all schools and principals were seen as being successful by their districts. The emphasis here was upon examining the different change facilitating roles that principals can take and to develop concrete descriptions of the day-to-day behaviors that made up that role. The final objective was to relate these styles to implementation success as it was defined in terms of teachers' use of the new curriculum. Schools or principals that were in "trouble" were not considered. Schools that were in danger of having unsuccessful implementations were not considered. This was an effort to identify and study varying degrees of success, rather than the all too familiar case studies of implementation failure.

Once agreement had been reached with the principal and the teachers for participation in the study, the principals received brief orientation and training in how to document the interventions that they were making. The intervention documentation procedures that the principals used were developed out of an earlier field study (Griffin, Goldstein & Hall, 1981). Principals were then interviewed on site at four different points during the school year and through bi-weekly telephone calls in which they nominate the various interventions that they had made. All of these interviews were audio tape-recorded. Subsequently the research staff used a special form to describe the different interventions and code the parts of each intervention that was identified.

The data analyses were based upon two intervention analysis frameworks that had been developed in previous research. These were the Intervention Taxonomy (Hall, Zigarmi & Hord, 1979; Hall & Hord, 1983) within which the various levels of interventions are identified. These levels vary from incident to tactic to strategy to game plan component to game plan and policy level interventions. The other analysis framework was the Intervention Anatomy framework (Hord, Hall & Zigarmi, 1980). With this framework the internal parts of interventions were coded. Each principal intervention was encoded in terms of source, target, function, location, medium, flow and duration. With these data it was then possible to do a series of systematic, quantitative and qualitative analyses about the frequency and character of the various interventions that the different principals made.

Findings

The findings have been reported in more systematic detail and a series of papers that were presented at the annual meeting of the American Educational Research Association in March of 1983 in Montreal (Rutherford, Hord & Huling, 1983; Hord, Huling & Stiegelbauer, 1983; Hall & Rutherford, 1983; Huling, Hall, Hord & Rutherford, 1983; Hord, Hall & Stiegelbauer, 1983). Some of the findings that related specifically to the change facilitator of the principal are summarized in Figure 2. In this particular analyses the incident level interventions were selected and comparisons were made in terms of the types and characteristics of the interventions that each style of principal did. As clearly can be seen, although many aspects of the principal interventions were similar, some striking and systematic differences were observed with the Initiator-style principals doing more of some types of interventions, Manager-style principals doing more or less of others and Responder-style principals doing more or less of still others.

The overall conclusion from this systematic study of principals was that the principals did indeed carry out interventions in ways that were consistent with each of the three change facilitator styles that had been identified.

Summary

The reader is invited to contact the authors or the director of communications at the R&D Center for Teacher Education if they wish to know more about the conceptual framework, data analyses and findings from this study. In general it was observed that different principals were internally consistent in terms of the interventions that they made as would be predicted in terms of their overall style. Further, as a result of the study it was possible to expand the descriptions of each style and to develop a set of behavioral indicators that could be used to more clearly identify the kinds of interventions that would be characteristic of each change facilitating style (Hall, Rutherford, Hord & Huling, 1983).

Another set of analyses that were done that have turned out to be particularly interesting had to do with relating the principal's change facilitator style to implementation success. To do this, each of the 9 study principals were assigned a rating with regard to how closely they approximated a particular style as described in the Figure 1 definitions. Based upon this rating it was possible to do a correlational analysis between the change facilitating style of the principal and implementation success (Huling, Hall, Hord & Rutherford, 1983).

Implementation success was defined in terms of the concepts of Stages of Concern (Hall & Rutherford, 1976), Levels of Use (Hall & Loucks, 1977) and Innovation Configurations (Hall & Loucks, 1981)

Figure 2

SUMMARY OF IDENTIFIED CELLS IN THE PRINCIPAL INCIDENT INTERVENTION CODINGS THAT CONTRIBUTED HEAVILY TO SIGNIFICANCE OF THE X^2 STATISTIC

Principals using the Initiator style did <u>more</u> than expected:

--interventions for global rule and policy decision making (Function 1A)

--interventions taking place in classrooms (Location 1C)

Principals using the Initiator style did <u>fewer</u> than expected:

--simple incident interventions (Sublevel 2)

--interventions aimed at individual teachers (Target 2)

--interventions aimed at central office innovation facilitators (Target 7)

--interventions aimed at subsets of teachers as intact groups (e.g., all 3rd grade teachers) (Target 3C)

--interventions that were interactive (Flow 2)

Principals using the Manager style did <u>more</u> than expected:

--interventions to subsets of teachers as groups (Target 3B)

--monitoring and evaluating to report findings (Function 4C)

--monitoring and evaluating that had to be specified by the coder (Function 4E)

Principals using the Responder style did <u>fewer</u> than expected:

--interventions that were complex incidents (Sublevel 3)

--interventions that were aimed directly at students (Target 1)

Hall, G. E. & Rutherford, W. L. Three change facilitator styles: How principals affect improvement efforts. Paper presented at the annual meeting of the American Educational Research Association, Montreal, 1983.

which are demonstrated ways for documenting implementation at the classroom level. To make judgments about which schools had more success a combination of research staff and key central office administrators from each of the study districts were brought together. They reviewed each dimension of implementation separately and rank-ordered the nine schools on it. These rankings were then combined to give an overall rating of implementation success.

The outcome of the correlational analysis was an overall correlation of .74 between change facilitating style and overall implementation success. This correlation was in the direction of schools with Manager-style principals having higher implementation than schools with Responder-style principals and schools with Initiator-style principals had higher implementation still.

This analyses tends to support the work of Edmonds and the summary of Leithwood and Montgomery, as well as Venezky and Winfield's (1979) description of characteristics of principals in more effective schools. The Initiator style seems to get more accomplished in terms of implementation in a shorter period of time. It should be noted that the Manager-style principals were also seen as successful, it was just that they did not move as far. Again, the Responder-style schools were not unsuccessful it is just that their rate of progress was slower.

A related analysis that adds further light on the role and effects of the principal's change facilitating style was to examine the psychological climate (Hall & Griffin, 1982) that was exhibited in each school. In terms of this analysis teachers in schools with Manager-style principals had a slightly more positive climate than teachers in schools that had Initiator-style principals. And climate scores for teachers with Responder-style principals came out lowest.

This analysis points out one of the dilemmas of the multivariate world that change facilitation and schooling is. On any single dimension one particular style of principal may look good. However, if the criterion for success is shifted then another style may seem to be more appropriate. The implication for all of us that are involved in research, evaluation, training, policy development and the monitoring of implementation is that the criterion for success that is being considered must be carefully thought out. Further, no one style is likely to be perfect for all situations.

A related discussion point out of the research that has been going on at the R&D Center for Teacher Education has to do with the possibility, readiness and likelihood of a person changing his or her style. It is our considered opinion at this point that a person does not change change facilitating style very easily. It is quite likely that individual behaviors can be changed and that principals will change the behaviors as the context within which they are working shifts. However, their overall style in terms of their motivation,

concerns and tone of delivery of interventions is likely to remain relatively constant.

There are many implications of this work, one certainly being that no two-day workshop is likely to change a principal's change facilitating style. It also suggests that in terms of planning for implementation that the style of the principal should be considered more closely, since the ancillary support that a particular school receives will likely need to be adjusted and be different in character depending upon the change facilitating style of the principal.

This particularly comes true when a related set of findings out of the Principal-Teacher Interaction Study are reported. A serendipitous discovery in this work was the identification of a Second Change Facilitator or Consigliere was a significant intervenor in each of the nine study schools (Hord, Stiegelbauer & Hall, 1983). Regardless of the change facilitating style of the principal there was a second person who served a very important change facilitating role. This Second CF or Consigliere was not necessarily the assistant principal and was not necessarily located within the building (although in the cases of Initiator and Manager-style principals they were).

The reason for raising this particular finding here is to point out that planning for change efforts in schools requires that more be considered than the style of the principal. Identification of the Consigliere becomes another key. We would further recommend that the principal and their Consigliere be provided with the leadership training in advance of implementation, and that they be viewed as a change facilitator throughout.

It is clear from the research that we have been doing that the principal is important, that different change facilitator styles can be identified and described, and that the day-to-day behaviors of principals can be sorted in terms of those that appear to be more useful and helpful in implementation. It also is clear that the principal should not be considered in isolation from his or her colleagues and other aspects of the school setting. The Consigliere is a key role and needs further consideration and elaboration. Also characteristics of the innovation itself need to be considered as implementation efforts are unfolding.

As a part of our ongoing research on supporting principals and teachers in implementation and examining the various role and strategies and techniques that can be used to facilitate implementation, the set of studies around the principal as a change facilitator have turned out to be very productive. As research continues and as we now explore the change process in the high school setting we are certain to identify other key variables and factors that should be and can be systematically considered in planning, facilitating and monitoring school improvement efforts.

We invite others to join in the search and we welcome exchange of ideas and the sharing of findings with regard to other research and practice experiences that can be related.

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INSTRUCTIONAL MANAGEMENT ACADEMY

Bruce Barnett and Ginny Lee
Instructional Management Program
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For the past two years the Instructional Management Program at Far West Laboratory has been investigating the role of the school principal. We have conducted intensive case studies in 17 elementary and secondary schools, and have interviewed over 100 principals. Our purpose has been to improve general knowledge about the principal's role in the hope that we can provide alternative models of leadership for principals who work in different kinds of schools and who hold different expectations for their students.

Our work demonstrates that successful principals:

- Can and do affect instructional programs
- Exercise their influence through routine management activities
- Take a wholistic view of their role by linking their management actions to their views of schooling and the needs of students
- Differ in the ways they approach instructional management

In addition, we have found that principals feel isolated and value the opportunity to talk with other people interested in their role. For this reason, the Instructional Management Program is continuing to conduct Instructional Management Academies. The first of these involved several groups of principals from different school districts during the 1983-1984 school year. The aims of the Academy are to allow participants an opportunity to:

- Analyse their management behavior through the processes of shadowing and reflective interviewing
- Receive support and insight from working with colleagues
- Learn what other principals are doing in their schools

Proposed Activities

Several Academy meetings will be held during the year to allow principals to gather information from each other about activities they perform on a day-to-day basis. The schedule of meetings is as follows:

Meeting 1: Principals will be taught how to "shadow" another principal by recording narrative field notes. These records are not an evaluation of principals' actions, but a descriptive account of what they do. Each principal will be required to conduct a shadow with his/her partner before the second meeting.

Meeting 2: Participants will learn how to use their shadow field notes to conduct a "reflective interview" with their partners. A reflective interview is conducted after each shadow and helps to clarify the observed events and the meanings principals attach to these events. Participants will practice forming "preliminary" reflective interview questions which provide useful background information about their partners' schools and their roles as instructional leaders. From this point on, at least one additional shadow and reflective interview will be conducted before each subsequent meeting.

Meeting 3: In order to determine how principal pairs are doing with their observations and interviews, the group will reconvene to discuss how the activities are proceeding. Suggestions for improvement and/or refinement will be made. Additional techniques for forming "advanced" reflective interview questions will be taught and practiced.

Meeting 4: Using data from previous shadows and reflective interviews, participants will begin to identify specific "themes" that are emerging in their partners' schools. Once these themes are identified, principal pairs will determine what information is needed to investigate these themes more fully. Subsequent shadows will be scheduled so that more specific data can be gathered.

Meeting 5: In conjunction with their partners, principals will use the information that has been collected during the previous shadows and reflective interviews to construct a preliminary model which provides a picture of their partners' schools and roles as principals. Participants will have the opportunity to react and respond to the models that their partners are composing.

Meeting 6: Based on their partners' reactions to their preliminary models, principals will formulate a final model. These completed models will follow our general framework, but will include individual variations and unique connections between the school context, instructional management behaviors, school climate, instructional organization, and student outcomes. Models will be shared among group members in order to show similarities and differences among principals and school situations.

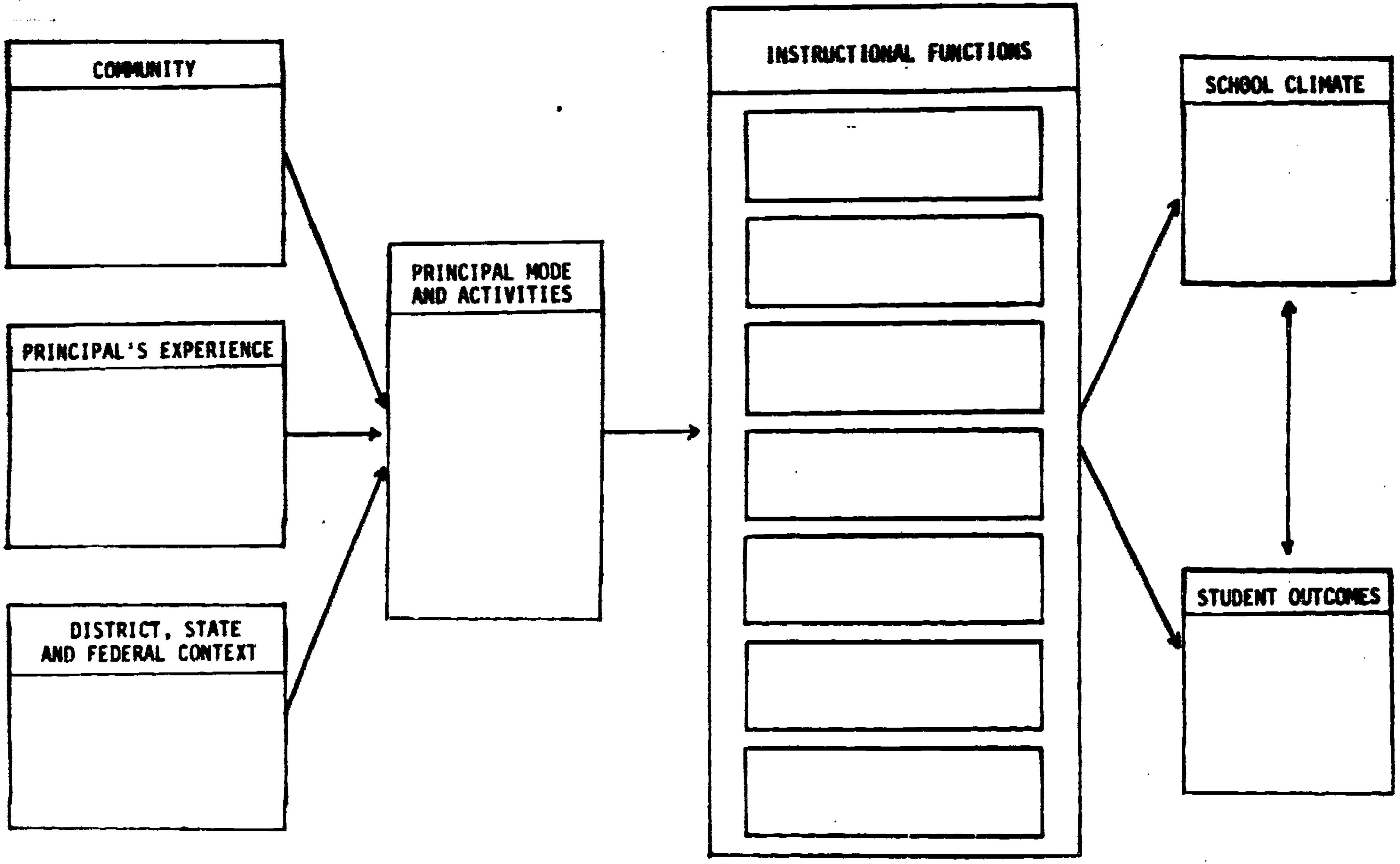
Time Commitment

The series of meetings, shadows, reflective interviews, and model generation should take about 13 or 14 days of a principal's time over the course of the year. Meetings will last an entire day. Each shadow should take about four hours, and the reflective interview another hour. It is anticipated that each participant will conduct 5 or 6 shadows/reflective interviews during the year. Because of the time commitment and intensity of this project, it is recommended to principals and school districts that this constitute the major professional development activity during the school year.

Continued Efforts

The needs and interests of the Academy participants will determine what, if any, second year activities might be appropriate. For example, at the conclusion of the first year, two options for continued follow-up might be pursued. First, if some participants feel the shadowing process is useful, we can begin to design a program whereby Academy principals become trainers for other principals interested in learning these techniques. Second, some participants might find this collegial group of principals to be a useful support group for discussing topics of interest or concern. As a topic arises, we can arrange for other principals (ones we have identified as part of our ongoing work with principals) to attend Academy sessions to provide some insight and guidance. Between meetings, principals might be shadowed and interviewed, thus allowing them the opportunity to reflect on how they are dealing with this issue in their own schools. In all cases, any continuing efforts will be determined collaboratively with principals interested in expanding the processes initiated during the first year.

The following diagram was used to lead participants through a group exercise which illustrates how all the components in the figure might influence a desired student outcome. The figure itself was derived from our research.



Principals can understand and influence the varied elements of their organizations through the performance of routine activities. Their success hinges on their ability to connect their actions to an overarching perspective of their school settings and their aspirations for students.

CHAPTER 3

TEACHER EFFECTIVENESS

David Berliner
University of Arizona

Thomas L. Good
University of Missouri-Columbia

Edmund T. Emmer
The University of Texas at Austin

Thomas L. Good
University of Missouri-Columbia

"My father was a bit curious about how I made a living studying how time and learning are related. He said, 'You mean you find out that you spend more time and you learn more?' I said yes, and he burst out laughing and said, 'Boy, you've really got them all conned.'"

"If you are evaluated with a test that is viewed as an indicator of the outcomes of education, but which is not matched to your curriculum, you are in deep trouble. You cannot possibly be effective as a school or a teacher if you have taught one thing but have allowed your students to be tested on something else."

"If we have to make clear to the students what it is we expect of them, then please notice that what is expected must be clear to the teacher — crystal clear. A teacher who does not know what is expected — what outcomes are desired — has been abandoned by the administrative staff of the district."

"Good teaching is a logical issue. It need not produce learning. A teacher who starts a lecture on time, provides a review, gives an advance organizer, emphasizes important points, asks higher order questions throughout, summarizes key issues, cracks a good joke, etc., may be judged to be a good teacher whether or not the students learn."

RESEARCH AND TEACHER EFFECTIVENESS

Remarks by
David Berliner
Professor, Department of Educational Psychology
University of Arizona

In deciding what I can share with you from my research background that might help you in your job of making schools more effective, I have decided to present a few rather simple propositions that are worth considering seriously as you visit classrooms. I understand most of you are principals and I think that you probably recognize that the whole movement toward effective schools rests on principals' shoulders. Whether you like it or not, you have ended up on the spot and it means a new role for some principals, an instructional leadership role. If you have not been visiting classrooms a lot, you are going to be pressured to do so. And when you get into the classrooms, you need certain kinds of spectacles to look at what goes on. I am going to try to provide you with some of those spectacles today--what to look for and what to think about as you visit classrooms.

I boiled down a lot of what I wanted to say into a single variable or single statement. It seems to me that <u>the single most important variable in determining whether or not you have an effective classroom is whether or not the delivered curriculum of that classroom is linked logically or empirically to the outcomes that are desired.</u> This is such a deceptively simple statement that it obviously needs elaboration. First of all it is concerned with what is sometimes called curriculum alignment, the congruence of the curriculum with the outcome, the overlap of curriculum with outcomes, or as it is most often called in the research community, opportunity to learn.

A student must have the opportunity to learn what it is that is expected of him or her. For certain subjects, it's crucial. You do not ordinarily learn trigonometry at home. The family is an important educator, but families do not teach trigonometry. There are lots of school curriculum areas that families don't help with. Some social studies can be learned around the table at home, but chemistry isn't usually learned at home. There are parts of the school curriculum that will only be learned if we expose our children to it in schools. Otherwise, they will never get exposed to some things we deem valuable.

What is expected of the student must be made clear to the student. The opportunity to learn it must be provided. If we have to make clear to the students what it is we expect of them, then please notice that what is expected must be clear to the teacher--

crystal clear. A teacher who does not know what is expected--what outcomes are desired--has been abandoned by the administrative staff of the district. That is a harsh statement. But if I talk to a teacher who says, "I don't know what anybody wants around here", I'm pretty sure where the blame is. I think it has to do with the administrative staff of a district not taking responsibility for saying, "this is what's expected." In addition, I would add that a teacher who knows the outcomes that are desired, but doesn't work toward them, is probably unmonitored by the administrative team of a district. Monitoring whether classes are doing work related to outcomes that are valued is a proper concern of administrators. If teachers do not know or do not work toward desired outcomes, what takes place is more like babysitting than it is education. Some of the oldest issues in education revolve around this problem. We need to know what knowledge or skills are worth acquiring. To repeat the title of a famous article at the turn of the century, we need to know "What knowledge is of most worth." The teachers and the administrators of a school district simply have to share a common belief that certain outcomes are expected for students at a given grade level in a given school.

I would remind you that the whole concept of effectiveness which brings you here today hinges on valuing some set of outcomes. You cannot talk about effectiveness unless you talk about what it is you are trying to teach. The outcomes issue is primary in discussions of effectiveness. Good teaching is a logical issue. It need not produce learning. A teacher who starts a lecture on time, provides a review, gives an advance organizer, emphasizes important points, asks higher order questions throughout, summarizes key issues, cracks a good joke, etc., may be judged to be a good teacher whether or not the students learn. Good and poor teaching is determined by values and knowledge of what standards of practice are. A doctor may have patients that die, but if the doctor used the best practices, she may be judged to be a good physician. An effective physician however, is associated with many fewer deaths. The outcomes for medicine are manifestly clear, and effectiveness is, therefore, easy to judge. The outcome for educators must also be made clear or we will not ever be able to judge effectiveness.

Please note, also, that we need not have 97 objectives for reading, 78 for math, 85 for science and a few hundred others for pro-social behavior and physical education. The behavioral objectives movement, I hope, is past the day when it forced too molecular a view on people and trivialized teaching and learning. We should not, however, throw out the baby with the bath water. Ten to 15 objectives for reading, another dozen or so for math, and another dozen or so for the rest of the curriculum are reasonable goals to shoot for. For a single course in the junior high or senior high level a dozen or so objectives is all that is necessary to proceed to thinking about effectiveness. But effectiveness cannot even be discussed without outcomes being prevalent in your mind.

Outcomes do not necessarily have to be test scores. As educators, we all have a legitimate interest in striving for dozens of outcomes for which no acceptable tests exist. For example, we usually state that we want to develop cooperative behavior among our students. This is an outcome we rightly value and for which no acceptable tests exist. In this case, effectiveness is still judged by determining if the curriculum delivered is logically matched to the outcomes desired. You don't always need a test, you can collect evidence by observation. Effectiveness can be judged by observing classroom processes and analyzing if such processes are related to the intentions of the district. A classroom that has downgraded competition and has implemented cooperative learning structures, uses criterion-referenced rather than norm-referenced tests, rewards helping behavior, etc., is one that is delivering a curriculum related to desired outcomes. If, however, tests are used as outcomes, then a concern for effectiveness means you should match the test to the curriculum. If you are evaluated with a test that is viewed as an indicator of the outcomes of education, but which is not matched to your curriculum, you are in deep trouble. You cannot possibly be effective as a school or a teacher if you have taught one thing but have allowed your students to be tested on something else.

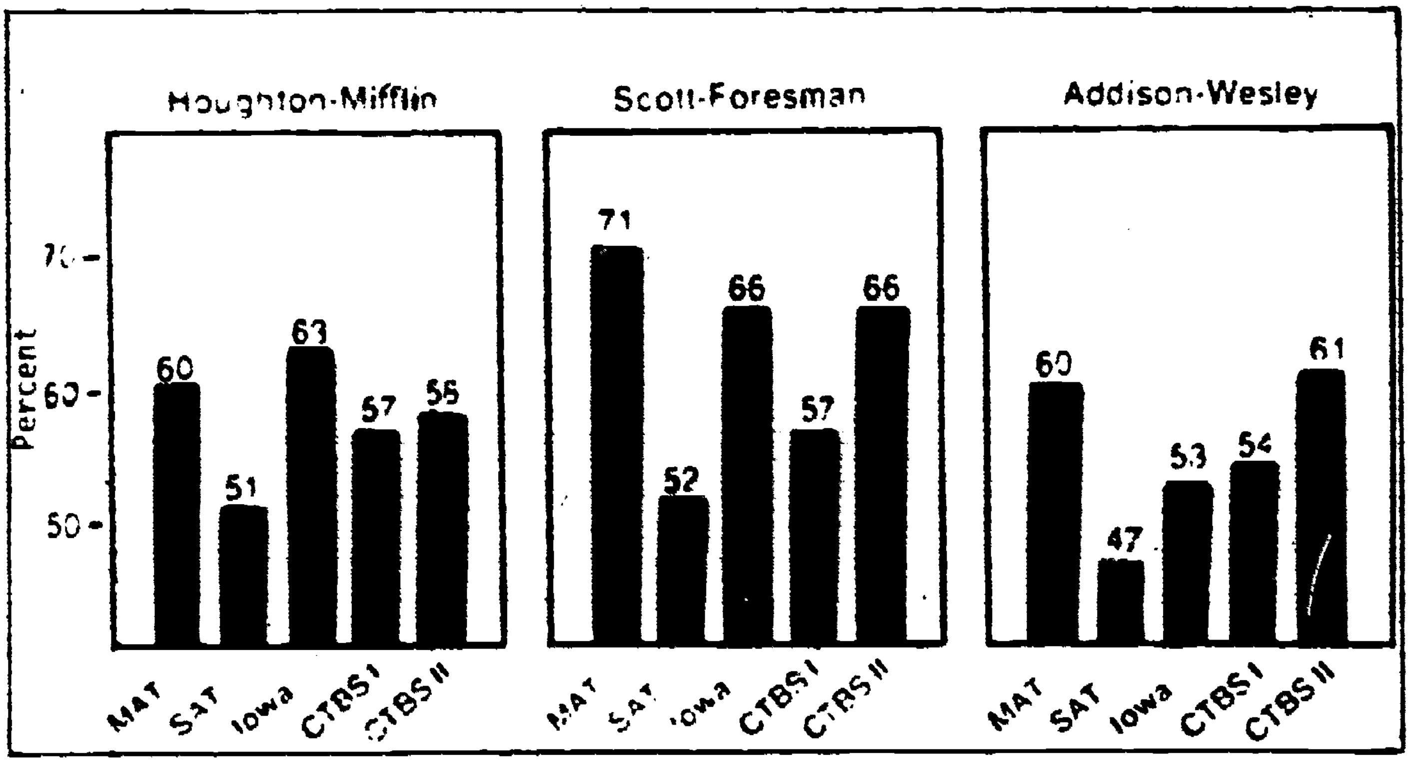
Are we educators so foolish that we have allowed ourselves to be trapped in so untenable a position? Is it possible that we actually use tests that are not matched to our curriculum, and in that way, vastly underestimate the productivity and effectiveness of our schools? I'd like to share with you some of the data to make you think about the link that has to occur between curriculum and outcome to even start to talk about effectiveness.

The study I cite has to do with the match between leading textbook series and some of the leading indicators, the tests, that are used around the nation to judge educational productivity and teacher effectiveness. At the fourth grade level, an analysis was done of every item in the textbooks of the Houghton-Mifflin, Scott Foresman, and Addison-Wesley series and every item on the math test included in five different standardized tests used to evaluate instruction at that grade level. The interesting question is: what is the overlap? Well, in the worst case, where a school district might be using the Addison-Wesley series and using the SAT as an outcome measure, there was 47% overlap, meaning 53% of the items on that test may never have been seen by the students before! (Figure 1)

I come from Arizona. The school districts in my area have had these data since the day I gave it to them about three years ago. They are still using a curriculum series and a standardized test that do not match. We know education is slow to change, but it is time to stop punishing ourselves this way. We have to ask questions about the instrumentation we use to judge effectiveness. If your curriculum and your tests don't match, you are in trouble. In the best case with the Scott-Foresman series and with the MAT, 71% of what the students faced on the test were things they experienced in the text;

30% were not. We are vastly underestimating our effectiveness when we allow ourselves to get trapped this way. We should never have outcomes that don't match what we do in our classes. So, to deal with the effectiveness issue you have to deal with outcomes and you have to deal with the curriculum, and ask whether they are sensibly aligned.

Figure 1. The Percent of Items Common to Both Texts and Tests in Regular Use in Elementary School Classes.



My first point is simply that the effective teacher has to have a match between the curriculum and the outcomes. You can't talk about effectiveness otherwise. Students must have the opportunity to learn what is on the test used to assess learning. But I said that it was the delivered curriculum that must be matched to outcomes. What do I mean by that? What does the term delivered mean? The way I use it, I define it as the involvement of students with materials, activities, ideas, concepts, and issues in which they have a marked degree of success. That to me signifies that a system is delivering a curriculum. Students are engaged and they are succeeding at something. That's the delivery system. A curriculum is delivered when students in a class show that they are engaged with and succeeding to learn what they are supposed to learn.

Three concepts are important here, and I want to go over them: Allocated Time, Engaged Time and Success Rate. I've discussed these before. I've written about them. The work I did at the Far West Laboratory a number of years ago revolved around them, but I continue to speak about them because you need to think about them as you go about your work in trying to improve schools.

Allocated Time

Let me start with the concept of allocated time. There is a positive relationship between the time allocated in instruction and achievement. Not every study shows it and when it's found it's not always a very strong predictor of achievement, but in general, the relationship between the time that's allocated to a curriculum area and the achievement in that area is positive and substantial.

When I first told my father I was studying the relationship of time to achievement, he started asking me questions. My father was a bit curious about how I made a living studying how time and learning are related. He said, "You mean you find out that you spend more time and you learn more?" I said "yes", and he burst out laughing and said, "Boy, you've really got them all conned. Does the government support that?" I said, once again. [illegible]". He said, "I'm sure glad I don't pay taxes anymore!" But I [illegible] I finally turned him around when I explained to him that the [illegible] was not really that time and achievement are in some way related. The finding that is important, and one which every educator has to deal with, is that the variability in the allocations of time across classes is enormous. Teachers make those time allocation decisions, and they are very important. Principals do not know what goes on behind the closed doors of classrooms. School superintendents don't know; state boards of education don't know. Teachers are making a set of complex decisions. Sometimes they are wonderful decisions, sometimes they are not.

TABLE 1
ALLOCATED TIME DECISIONS FOR READING AND MATHEMATICS IN SELECTED GRADE TWO AND GRADE FIVE CLASSES

Grade Two				Grade Five			
Reading		Mathematics		Reading		Mathematics	
Class	Allocated Minutes	Class	Allocated Minutes	Class	Allocated Minutes	Class	Allocated Minutes
A	47	F	16	N	68	R	20
B	66	G	24	M	88	S	36
C	85	H	35	O	102	T	53
D	103	I	42	P	121	U	64
E	118	J	51	Q	137	V	73
Range=71 min/day		Range=35 min/day		Range=69 min/day		Range=53 min/day	

Adapted from Dishaw, 1977 (a) & 1977 (b)

In Table 1 we present examples from our second and fifth grade reading and mathematics data. This is the daily time allocated to mathematics by the teacher in these elementary classrooms. What is of great interest is the variability. One teacher in the 5th grade allocates 20 minutes a day to mathematics, another allocates 73 minutes a day. They're working with the same length of the school day and one is providing 20 minutes, the other 73 minutes. It's easy to tell which class is likely to do better on the state test of achievement. I really don't know how much time should be spent on math. I also don't know what's the maximum time students can spend at math before going bonkers. I am sure, however, that 20 minutes a day is inappropriate. If you go into classrooms you ought to consider the time variable.

With the grade five reading data the issue is again not how much time, on the average, is spent in reading (Table 1). The question is: What factors make one teacher allocate 68 minutes to reading and another one 137 minutes to reading? Two hours of time in a curriculum area is very different from one hour of time in a curriculum area. It's twice as much. What happens in a school to allow that?

The allocations of time to the curriculum areas are determined by the elementary school teachers. At the junior highs and at the senior highs those times are fixed. The next question about allocation, then, is: How much time is allocated <u>within</u> the subject matter area to particular content areas? Both the junior and senior high teacher has to decide how much time to spend on two column addition, on quadratic equations, on ecology, or biology, etc. Again the issue is variation. For example, in the area of fractions, over 90 or so days one teacher spent zero time on fractions. Another teacher spent 400 minutes teaching fractions to her class. The state required fractions at this grade, but this teacher did not spend any time on fractions. I asked the teacher at the end of the study, "You know, you didn't spend any time on fractions." The teacher said, "Really?" I said, "Yes." The teacher said, "I don't like fractions."

My first response was anger but my second response was, I think, much more appropriate. The fact is that none of us do what it is we don't want to do, and we confuse our personal decisions with our professional decisions. The teacher was making a personal decision--I don't like it so I'll leave it out. Teachers need to make professional decisions. Very few teachers are reminded of this. A feedback system is missing. If they drop an area of the curriculum out because they don't like it, nobody is there to notice. There is not any feedback among teachers or by the instructional leaders to prevent this from happening.

What has become clear from the research at Michigan State University is that the decisions made by teachers about what content to teach are based on three factors: how much they like the area; how much preparation the area requires for them; and how difficult they

perceive it to be for their students. Teachers hate to torture their students. So, if they think it's going to be difficult for their kids they might drop something out. Those are personal decisions. I am not sure they are proper professional decisions. Since nobody is giving teachers feedback, we are always in danger of getting variability like this.

TABLE 2
ALLOCATED TIME DECISIONS IN DIFFERENT CONTENT AREAS
FOR READING (GRADE 5) AND MATHEMATICS (GRADE 2)

READING & LANGUAGE ARTS	Total Allocated Minutes				MATHEMATICS	Total Allocated Minutes			
Content Area	Class 1	Class 3	Class 11	Class 25	Content Area	Class 3	Class 21	Class 8	Class 13
Comprehension Activities Synthesis & Inference	235	252	1432	306	Computation: Speed Tests	232	31	71	100
Comprehension Activities Translation & Paraphrasing	122	151	1649	383	Word Problems	109	226	416	132
Oral Reading	604	63	885	305	Fractions	0	21	63	399
Creative Writing	56	343	98	573	Linear Measurement	29	130	107	400

Adapted from Fishaw 1977 (a) & 1977 (b). A more complete discussion of these data may be found in Berliner, 1979.

The same is true of the reading area. The allocation of time there becomes important because of what is now a national concern, the area of comprehension. Allocated time in comprehension in these classrooms is presented in Table 2. In one classroom the average child spends 122 minutes doing translating and paraphrasing, 235 minutes in inference and synthesis activities. These children are trying to read something and answer the question, what does it mean? They have to put it in their own words. Now, those of you who have been around in the last decade know that students couldn't decode anything back in the 1960s and up to the 1970s. In this decade, they decode fine; they just can't understand anything! That seems to be a national concern. Well, if that's true, one of the reasons that one might be concerned about time is whether, in fact, students are getting any instruction in comprehending. One of these classrooms manages to total about 400 minutes in comprehension activities in its reading and language arts program. As is seen on Table 2, another classroom gets 3,000 minutes of such instruction. It's not

very difficult to figure out which classroom is likely to do better on that one item on the State test that says: "Read this paragraph and tell me which of the following statements is the best title for the paragraph." It's a comprehension item, and it's on every test from about third grade through college entrance. The allocation of time, the decisions about what content to teach and how much time to put in are very crucial decisions and they are often made without much discussion with and feedback to teachers.

Engaged Time

The next concept that has to be dealt with in talking about instructional delivery is the issue of engaged time. The issue of engaged time is not very startling either. My father would be incredulous, once again, when he said, "You mean if kids pay attention they learn more?" As I said, "Yes," he'd laugh again and wonder how you make a living telling people such startling news! The issue has nothing to do with that common sense finding. The issue is, do classrooms vary enormously in the mean engaged time recorded for the class? The answer, again, is yes. In one classroom you find 50% of the students engaged at any one time you are looking. In another classroom 90% of the students are engaged at all times. What's the difference between the two classrooms? What does it mean for the delivered curriculum? Very simply, if a teacher has a 50 minute allocation to math, and 50% engagement, the children are getting 25 minutes a day. If there is 90% engagement, the students get 45 minutes a day. That's 20 minutes a day difference in time. That equals 100 minutes a week. Those are big blocks of instructional time. What is delivered in sheer amount of curriculum to students in two different classrooms may be very, very different.

It is interesting to think about the delivery of curriculum and the time variables as follows. We can start by thinking of a school year, and then must say but it's not a "year", it's only 9 months or 180 days. But then, it's not really 180 days, because we have to subtract from that. What do we have to subtract? Well, the teacher is absent once in a while, the kids are absent once in a while, the teacher takes a mental health day once in a while, the buses break down, snow occurs and you don't make up the day, etc. What are we back to in terms of instructional days in a district? 150 at most? Let's say 150 instructional days. I don't think that's uncommon. And let's say many of the early grades are allocating 30 minutes a day to mathematics at a 50% engagement rate. You then are delivering 15 minutes a day of mathematics. Lets go over that again. If 30 minutes a day is what is allocated for 150 days, that gives you 75 hours of mathematics instruction for the entire school "year." And if the engagement rate is 50 percent, then what's delivered in mathematics is 37-1/2 hours of time on task. By adult standards, that's under one week's work. It is not any wonder to me, when I think about standardized testing programs, that getting two items right can give you 8 months advantage on those tests. If all we're

delivering in certain classrooms is 40 hours of delivered curriculum in math, about two items more is all you can expect for the whole year.

Now, these kinds of data are not meant to say that all teachers are like this and that every classroom suffers. But if you're talking about school effectiveness, you might want to find those classes where these kinds of data are obtained. Maybe it's 20% of the classes in your district; maybe it's 15%. But whatever the number, those classes can be helped because these are remediable kinds of variables. If you want a more effective school, you've got to get more instruction delivered. It's not a very difficult concept to deal with. We worked in schools where we were able to peek in classrooms that we weren't invited to look in. All of our teachers were volunteers, but because many of them were in pod schools, you could sit in the center of the pod and watch the teacher who invited you, and all the other teachers, without them knowing. An interesting question is: What's delivered in some of those classrooms that we weren't invited into? We had the feeling that some large percent, somewhere between 5 and 15 percent of the school classrooms were not delivering 100 hours, total, in reading and math, in the elementary grade levels! Do you want to have a more effective school system? Find <u>those</u> classrooms and provide feedback for <u>those</u> teachers. Most of <u>them didn't</u> know what they were actually <u>delivering</u>. They aren't used to thinking that way. These concepts help you to think about classrooms and, thank goodness, the numerical values of variables like how much instruction is being delivered are easy to change.

The engaged time variable, we think, is very important. After we finished this project, I went to the library to do some further research on what we had done. I found out that we had replicated the results of somebody who did this study in 1888. In fact, the issue of time and instruction is on a 20 year cycle. A man named Curry in 1884, and then Judd again in 1918, and then some people in the 1930s, and Phil Jackson in the 1960s, and then some of us in the 70s and 80s are part of the cyclical discovery of time variables. Everyone says time is important, and every 20 years someone says not enough of it is being spent. People are concerned about time. It's not a magic variable; it's not a very complex variable. But the allocations of time to instructional areas and then the engaged time in those instructional areas are very important concepts with which to think about classrooms.

<u>Success Rate</u>

The next concept I want to deal with is that of success rate. Again, in our study, we found something we think gets rediscovered every now and then. That is the concept of success for young children. We studied whether the children were succeeding at what they were doing or whether the material was too difficult for them. Our thinking was that the match of curriculum to a child is an

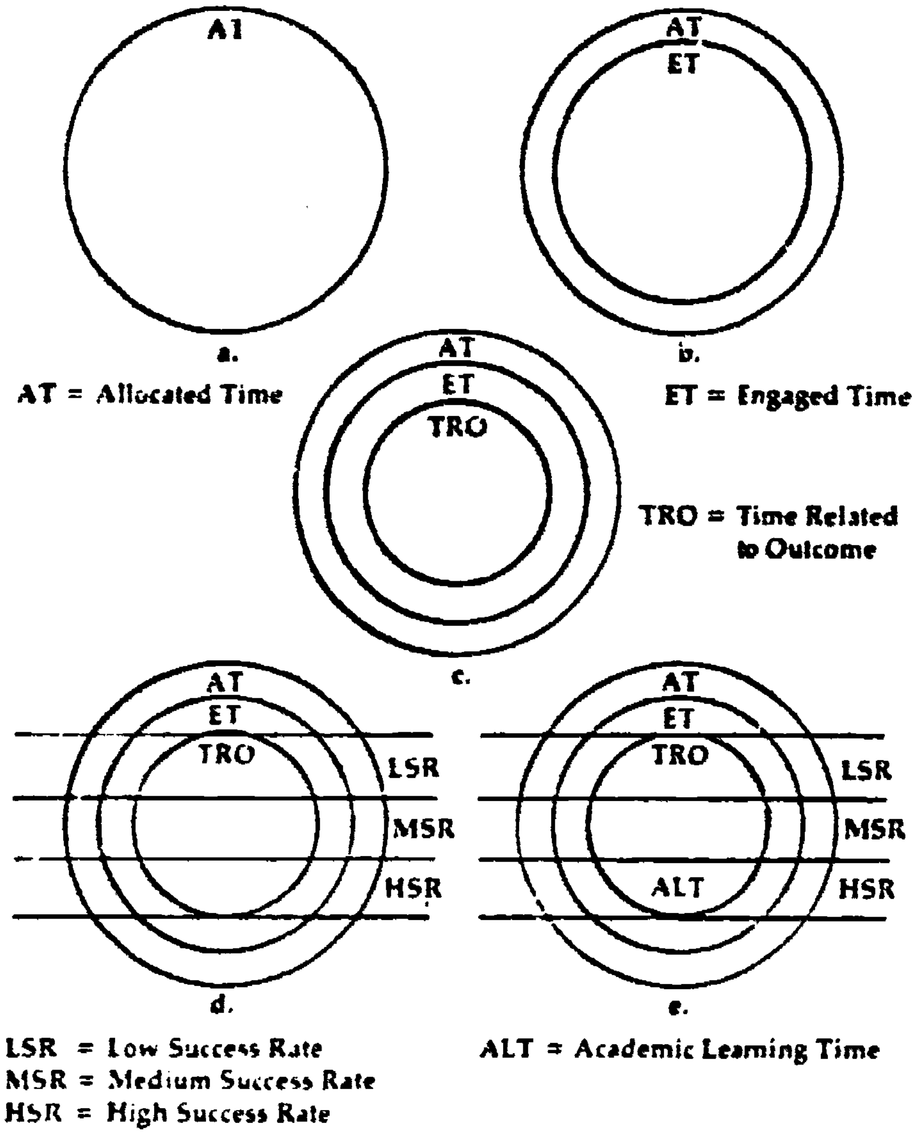
important and very complex teacher behavior. And of course teachers are not sadists. If they see children failing at something, they change the curriculum as quickly as possible. Nevertheless, in our study we did find classrooms where 14% of the school day would be coded by our observers as high failure experiences. Students were constantly failing. Would you like to have a predictor of failing performance on outcome measures? Failing performance in a classroom is a very good one!

If a child can't do two column addition in a classroom, a child is not going to do two column addition on an outcome measure. If a child succeeds at two column addition in the classroom, it's very likely the child will do well on a two column addition problem on the outcome. So, looking at the success and failure rates within a classroom becomes an important concern. In our study, we found that high success was incredibly important for young children. Jere Brophy and Barak Rosenshine, researchers in this area, say that unless recitation activites are at the 80% success rate they're likely not to produce much achievement, and unless seatwork or homework is up around 95% success, they may not have much value. And that seems particularly true in those areas of the curriculum that are hierarchically formed, like mathematics. If you don't really learn addition, you're going to have trouble with multiplication, and if you don't really learn subtraction, you're going to have trouble with long division. There are lots of areas of the curriculum that are hierarchically formed, and it means that success early in the curriculum does determine success later in the curriculum. Our data are clear on this for young children. Thus success rate becomes an important variable for thinking about classroom instruction.

Academic Learning Time

I've talked about allocations of time and I've talked about engaged time and I've talked about success rate and I want to bring those together for you, in the single concept that I think is one of the important ones to think about when you go into classrooms. It's the concept we called academic learning time, ALT. One of the products of the many recent studies of teaching that I think is important is this ALT variable. We've defined it in our work as engaged time with materials or activities that produce a high success rate and that are related to the outcome measures that are being used. It characterizes a lot about what I've said about the alignment of curriculum with outcomes and about the time variables. Let me try to define it better with a diagram (Figure 2). We said that the allocation of time at the junior and senior high schools is fixed, but at the elementary schools the teachers make the decision of how much time to give to music, reading, math, etc. We started with the notion that there is an allocation of time. The next concept we analyzed was engaged time which is some subset of the allocated time. You don't expect these variable to be equal. That

Figure 2. Defining Academic Learning Time (ALT).



Interpretation: The time allocated for instruction is shown visually in (a). During some of this time, students are engaged, as shown in (b). Some of the time students are engaged is time related to the outcome measures that are used to assess instruction. This is shown visually in (c). The time allocated, whether engaged or not, and whether related to the outcome measures or not, can by yielding low, medium, or high success rates for students (d). That portion of allocated time that is time engaged in activities related to the outcome measures and which provides students with a high success rate is defined as Academic Learning Time, as shown in (e).

is, you don't expect 100% engaged time. It's a subset. 90% would be nice, 85% would be nice. 20% would be bad.

We also said that you could conceive of the success rates of students when you're working with them: some of the time they are engaged they will be having high success; some of the time they are engaged they will be having medium success; and some of the time they will experience very low success. And you sort of hope that the amount of time they spend in low success activities would be small because failure is not good on a regular basis. Moreover, in our work, we found out that high success was an extremely important predictor of achievement.

So these are the concepts we have worked on so far, allocated time, engaged time, and success rate. I started off by saying one of the key variables was whether the curriculum is related to the outcome. Well we don't expect everything a teacher does to be related to outcomes. If we did we'd have automatons as teachers. There'd be no spontaneity; there'd be no fun in teaching. The biggest criticism of Becker and Englemann's programs, the Distar programs, is not that they don't work, because they do. The biggest criticism is that they force teachers into reading from manuals, pointing when they're supposed to, having students chant when they're supposed to, etc. Every part of the teacher's activity is, in fact, related to the outcomes as defined by Becker and Englemann, and it drives a lot of teachers to drink at an early age. Not everything that's going to happen in classrooms is expected to be related to the outcomes. If a teacher is teaching a geometry lesson and somebody says, "that's a beautiful shape," it's perfectly sensible that the teacher would talk about how the concepts of beauty and the concepts of geometry were once wedded and that the history of Western civilization is based on philosophy and mathematics being intertwined. Nevertheless, some part of the teaching act ought to be related to the outcomes. I've never seen a geometry test that asked about beauty. I have seen many geometry tests that check if students know the number of angles that are equal in an isosceles triangle. And the teacher is there to teach some things like that.

Now, let's put this all together as we have in Figure 2. We say that some part of the allocation of time, whether it's fixed or variable, depending on grade level, is engaged time. Some part of that time is also related to the outcomes, and some part of that time is high success. We're calling that intersecting zone academic learning time. You can measure it in minutes. You can walk into a classroom and get a feel for whether the class is involved in the things they're supposed to be. We can measure it; we call it ALT. It's not easy to measure, but it's a very good predictor of achievement. Why shouldn't it be? It says that kids are engaged. It says that they're succeeding at tasks like the ones that are part of the outcome, and that what they're doing is in fact related to the outcomes. It really is a very interesting variable.

Now, I have to ask you to think for a moment about the variable of ALT again. When we created it we didn't quite have the full picture in mind. We were accused by many educational researchers and psychologists of measuring the measurable. You know, we go out with stop watches and we count things, and we go fo the easily countable, the easily measurable, and we never deal with 'quality." I hear that all the time. The ALT variable may be revolutionary, in a way, because it may be the first measure we have of quality. I'd like to challenge you to give me a better definition of quality instruction than mine. You walk into a classroom and the kids were working on activities or with materials or dealing with things that are related to outcomes that are valued. They are engaged and they are succeeding at what they are doing. What else do you want? It strikes me that if I walked into a classroom and I could say that, I would be very happy. I can't hold the teacher responsible for the achievement that's going to show up on the test, but I want to be able to hold my teachers responsible for the classroom behavior I observed. Students should be doing things that are related to outcomes, they should be succeeding at them, and they should be engaged in the tasks. It strikes me that that's a pretty good working definition of quality in instruction when you are looking behind classroom doors. And I think, therefore, that the variable is not just easily measurable and just dealing with time. I think it becomes a very important concept for looking into classrooms.

One of the criticisms teachers have always had of the people who look into their classrooms is that they didn't know what to look for. That's why teachers were rated on such things as the neatness of their bulletin board and their clothing. I think with the advent of ALT, we are at the point where we can say, we now know what to look for. We do know what events are likely to produce achievement in classrooms. Is there evidence for this? Well, yes. It's not of the type that might overwhelm the Nobel committee, but it's of the type that might be very useful to an educator.

Let me interpret some of the data in Table 3. Envision three children who start out with a raw score on a test of 36. They're at the 50th percentile on our sample. These are three average kids in the sample we used. They then proceed to work for the next five weeks in their reading and we count the number of minutes each day that we would call ALT, Academic Learning Time. ALT is the number of minutes in which they are engaged in, succeeding, and working on tasks related to the reading outcomes. In one class, the children accumulated 100 minutes of ALT, in another class 573, and in another 1300. The average daily time, in minutes, turns out to be 4 minutes a day, 23 minutes a day, and 52 minutes a day, respectively. The use of the regression equations we created for estimation gives us the following information. Five weeks later we can expect the child who got four minutes a day of ALT to pick up one more item on our test and get a score of 37. The second child gets seven more items on the test right, and gets a score of 43. The third child gets 16 items more and gets a score of 52. They've all been working at reading,

but their growth is different. More important, their placement in that sample is vastly different. Here are three children who start out average and end up, based on ALT, at the 39th percentile, the 50th percentile, and the 66th percentile on the same kinds of tests. It's a pretty powerful variable. At least powerful enough to take seriously.

TABLE 3
ACADEMIC LEARNING TIME AND STUDENT ACHIEVEMENT:
EXAMPLES FROM GRADE 2 READING BASED ON
BTES (PHASE III-B) RESULTS
(A-B PERIOD)

Reading Score at A (October)		Student Engaged Time in Reading with High Success Rate		Estimated Reading Score at B (December)	
Raw Score (out of 100)	Percentile	Total Time Over 5 Weeks (Minutes)	Average Daily Time (Minutes)	Raw Score (out of 100)	Percentile
36	50	100	4	37	39
36	50	573	23	43	50
36	50	1300	52	52	66
15	17	100	4	20	15
16	17	573	23	25	21
16	17	1300	52	35	36

Notes

1 An average of 25 school days occurred between the A and B testing.
2 The B reading scores are estimated via linear regression.
3 The values of all variables in this table are within the ranges actually obtained in the BTES sample.
4 The average engaged time with high success rate in grade 2 reading for the A-B period was 573 minutes.

In the data I presented to you, it may appear that the range of 4 to 52 minutes a day is unrealistically large. These values, however, actually occurred in the classes in our study. Furthermore, one can easily imagine how either 4 or 52 minutes per day of academic learning time might come about. If 50 minutes of reading instruction per day is allocated to a student who pays attention only about a third of the time and only one fourth of the student's reading time is at a high level of success, then that student will experience only about four minutes a day of engaged reading at a high success level. Similarly if 100 minutes per day is allocated for reading for a student who pays attention 85% of the time at a high level of success

for almost two thirds of the time, then that student will accumulate over 50 minutes a day of ALT. These differences in ALT do result in differences in achievement.

So, I believe ALT is a good predictor. Thus, if you need to go into classrooms and are worried about whether a teacher will be effective or not, why don't you ask some questions like the following: Ask if the time allocated is adequate for the curriculum area or to the content areas within that curriculum area. Ask if the engaged time is sufficient to ensure that what is delivered might actually result in learning. Ask if students appear to be successful in their classroom work. Ask if the work is logically related to the outcomes of the course or the curriculum area. Ask if the pace is sufficient to cover all the objectives held for the course or for that grade level because if the pace is not sufficient, students would not have had the opportunity to learn all they are supposed to learn. In Tucson, I went to a group of teachers in the same grade level who were working with the same Basal series and I said, "Where are you in the teacher's manual that goes with this series?" They said "What do you mean?" And, I said, "What page are you on? How much of it did you cover?" Well, some were done and had been done for a month, and were on to all sorts of reading enrichment programs. Some were on page 99 of a 400 page teacher's manual. That's pace. The raw amount covered would seem to be a good predictor of achievement. Why not? If people aren't exposed to certain things, they're not likely to do well on tests of those things. In the cross national comparisons between the United States and other countries, the single most important variable explaining differences in the achievement of different countries was whether or not students in those countries had been exposed to the content.

Then, after you ask that set of questions, you have to arm yourself with some observational instruments that reflect a set of teaching variables that you believe in to see how those variables might affect the delivery of the curriculum. What teaching variables should you look for? What are the ones to have faith in? I think everyone has to find that out for themselves and read the literature for themselves. I'll tell you what my favorites are from my research and my reading of the literature. I think most of this list would be agreed to by other people, but certainly not all of it. Structuring feedback, monitoring, conviviality, handling transitions, management of deviance, safety, order and academic focus are some of the things I look for when I go into a classroom.

I look at structuring because it tells children what to expect. By structuring we mean the teacher tells the kids what they should be doing. Instead of the teacher saying, "O.K. spelling", the teacher says, "We're doing spelling. We're on page 47 of the workbook. Everybody get out your spelling books and those of you that are excused from it, here's what you're to do." They structure the activity. Why is this important? A couple of reasons. Kids often don't know what the command "spelling" means. In a highly mobile

society like ours, we're dealing with 50, 60 and 100 percent turnover in some of the urban areas. The teacher may present the rules for classrooms early in the year, but by mid-year most of those kids are gone and the teacher then is assuming that the shorthand way of telling kids what's to be done is understood. Some of those kids haven't got a clue! The teachers who structure tell students what's expected, where to be in the material, and give directions. Teachers who structure seem to be those that in fact have higher achievement. Of course it can be abused. We saw one study done at Wisconsin where the instructions for what to do far exceeded the doing of one workbook page. The teacher went on 20 minutes about how to do it and the kids were through in three. There are extremes of structuring.

I look at feedback because our research says that academic feedback keeps success high. It keeps children from being failures too long. The teacher says, "That's not correct, here's how to do it." A teacher who finds ways to provide academic feedback often has children whose success rate is higher, and that's a predictor of achievement.

I look at monitoring because in today's schools, particularly the elementary schools, students have as much as 60% of the school day spent at independent work. Kids work at tables. They work in workbooks. They work on those blue sheets that elves produce at night in schools. Every morning there are stacks of elf-supplied worksheets. And if nobody is monitoring what children do, then it's not nusual to find a second grader not doing it. What does that mean for the teacher? It means you have to wander the class or have an aide who wanders the class and keeps the monitoring rates high.

I look at conviviality, which is our code name for a whole bunch of things. Conviviality shows me that the classroom is a nice place to have kids. It means the attendance is likely to be high, the sickness rate low, the throw-up rate low, the anxiety down. And that's what you want for kids. They can't work unless they feel comfortable and safe.

I look at whether a teacher handles transitions adequately. In our study of management of time in classrooms we had one teacher who was very concerned with having a modern classroom with resource centers all around the classroom--a listening center for reading, a math facts center, a social science center, the hamster center for studying this and that. Every 20 or 30 minutes children would be moving around the classroom and the teacher had what was clearly an exciting place to be. In a 306 minute school day, 76 minutes were clocked as transitional time. The kids were getting into activities and getting out of activities and not spending the time in the activity. One should look at that. The greatest transition problems are with art teachers and physical ed teachers. It takes so long to get ready to do art and physical ed and it takes so long to break it down and put it away that sometimes we actually lose art and physical ed. But the same is true of reading in some classes, and the same is

true of mathematics. The transitions need to be handled. When I go out into classrooms I look at the transitions and their effect on engaged time, because if the transitions are too long, engaged time plummets.

I look at management of deviance and I look for the kind of teacher who has what Kovnin called with-it-ness. I look for teachers who can control the classroom, who make very few timing and targeting errors in the way that Kovnin talks about it, Walter Borg talks about it, the way Emmer and Evertson talk about these concepts now in their handbooks. I look at whether the classroom and the school are safe, orderly, and academically focused because we now know you can't expect achievement in a place that's not orderly or that's not safe. An academic focus is important, but that doesn't mean the teacher can't laugh and joke and have a good time, and that kids can't be happy. It means that after the laughter and the joking, the teacher knows to bring them back to the task at hand.

Summary

Teacher decisions and behavior affect what parts of the curriculum the student learns. They pick the tasks and the time on tasks. Teacher's decisions and behavior affect the success of students in class. Teacher's decisions and behavior affect the students' engagement and the time on the right task in classes. Teacher decisions and behavior affect the students' attitudes toward schools which affect attendance, climate, and management. In my view the teacher decisions and behavior only affect achievement outcomes if they work through student involvement and success with the right tasks. What are the right tasks? At least some of them are the tasks that are used to judge effectiveness. Thus, my original, deceptively simple point is stated again: Teachers who deliver a curriculum to students that is matched to outcomes are likely to be effective. What is nice is that research has helped us find a good classroom indicator of whether effectiveness is likely, that is the ALT variable, consisting of allocated time, engaged time, success rate, and the relationship of activity to outcome. I hope these ideas are helpful as you go out and observe classrooms.

Research and Teacher Effectiveness

These are good times, really. Research on teaching has given us a set of variables to look at that relate to engagement and success. These should be looked at closely. Research has given us an advantage over preceeding generations, and I think you should use that research wisely. The "Nay Sayers" say that our findings are weak, that the correlations are low, that the experimental findings don't always hold up. That may be true but that doesn't mean that research can't produce any useful ideas. The original study of the effect of cigarette smoking on cancerous conditions showed a correla-

tion between smoking and cancerous cells in the lungs of about .14. It's trivial. In education we say "I won't pay any attention to correlations like that." Nevertheless, it makes sense that cigarette smoking is likely to produce some harm. Some of our variables in education make sense, even if the correlations are not high.

I think we're short changing research. Two and three percent increments in our knowledge about what happens to kids are powerful findings. The research that we have now does that. Its strength is also that it is quite useful. For example, the ALT concept may be a way to measure something we think of as "quality." So I think a revolution is taking place. Research is on its way to help us in understanding the elusive nature of quality. We will in time be able to provide insights into instruction that is both "good" and that is "effective." I can't give it all to you in a brief visit like this, but if you'll read widely in this literature and interpret the literature humanly, you'll probably end up thinking of your teachers as handling one of the most complex environments we've ever asked anybody to face.

How do you take care of pace and make sure that everybody gets through, while at the same time you're keeping success rate high? How do you keep engagement high when you've been given mainstreamed kids and you have to pay special attention to one or two kids in your classroom? We've asked the impossible of teachers. The research findings are going to have to be filtered through you, as instructional leaders, and be used humanly in studying the context that you're walking into. The issue of pace may have to be abandoned for part of the school term as the teacher is just simply establishing order. The issue of success rate may have to go by the boards as the teachers bring something else into line. Many teachers say, "I wish you'd come visit in November, I don't get my class started until then." They've had them since September, but they may be right. It takes time to get these systems going, and we can't just apply research evidence and say why aren't you teaching fractions? It may be inappropriate at that time. You have to check with your teachers and use them as guides, too. I've learned to do that as I've talked to them. If you think about the humane use of the research, I think you will find that the research can help you improve your schools.

"If teachers establish reasonable and workable rules, hold positive expectations for student participation in those rules, and insist upon appropriate behavior when necessary, I believe that students will understand the teacher's seriousness and purposefulness about classroom management and will begin to internalize classroom rules, expectations, and procedures."

"In the last decade researchers have produced direct evidence to refute the myth that teachers do not make a difference. This is important information in relation to policy, because it indicates that teachers are a vital investment."

TEACHER EFFECTS

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This paper presents some recently reported findings that associate teaching behavior with student achievement. It is important to emphasize that research on teaching effects cannot be equated with teacher effectiveness per se, in part because research has primarily emphasized the effects of instructional behavior on the mean or average performance of students on achievement tests. Although this is certainly important information, teachers are expected to accomplish more than simply stimulating student achievement in basic areas. Those who wish to use the results of this research in teacher education and/or evaluation programs should therefore study the limitations of extant data. These limitations have been discussed at length elsewhere (Brophy & Good, in press; Good, 1983, in press; Good & Brophy, in press). Furthermore, I believe that presenting research information about improving classroom performance to teachers will be effective only if the findings are accompanied by detailed information about decision making (applying findings to particular contexts) as well as knowledge about student learning and development and subject matter and curriculum development. (For a detailed discussion of this perspective see Good & Brophy, 1978, 1984).

General Review

A major purpose of this article is to describe some of the variation in classroom process and to illustrate how these behaviors influence student achievement (for more complete reviews see Brophy, 1979, 1983; Good, in press; Good, Grouws, & Ebmeier, 1983; Good & Hinkel, 1982; Rosenshine, 1983; Weinstein, 1983).

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** The author has written extensively upon this topic recently, and portion, of the present article have drawn upon other recent articles Brophy & Good, in press; Good, 1982, 1983, in press; Good & Brophy, in press; Good & Hinkel, 1982).

Variation in Time Usage

Data collected in the Beginning Teacher Evaluation Study has shown that the amount of time allocated to a particular topic varies considerably from school to school and from classroom to classroom. Furthermore, once instruction in a subject has begun, studies show that the actual time spent on instruction varies among classrooms. Estimates differ, but studies basically indicate that only about 50 to 60% of the school day is actually used for instruction.

However, although variations in amount of time-on-task occur across days, students, and classrooms, little research has attempted to ascertain the sources of this variation: student factors, classroom teaching practices, or day-to-day fluctuations. It is clear from a variety of studies, though, that teachers' beliefs and behaviors are strongly related to time utilization (e.g., Arlin, 1982; Schmidt & Buchmann, in press).

Finally, it is worth noting that some areas of the curriculum appear to receive but little instructional time. In a study of 75 teachers in Grades 2-6, Ebmeier and Ziomek (1983) found that an average of only 15 minutes per week was spent on science in second grade classes. By fifth grade, this time had only increased to 43 minutes. Furthermore, the time spent on science in most classes was considerably lower than what the district recommended.

Mode of instruction is a manipulable variable which has been shown to be related to engagement. Using the BTES data, Rosenshine (1980) found that engagement was 70% during unsupervised seatwork and 84% during teacher-led discussion. These differences are important because students spend about 70% of classroom time doing seatwork, a practice necessitated by grouping. However, whether whole- or small-group instruction is better depends upon whether the losses in time through grouping are compensated for by increased quality of group instruction (appropriate seatwork tasks; instruction which is better matched to students' ability). However, most empirical evidence suggests that too often classroom designs that call for large amounts of student seatwork are marked by insufficient procedural details and tasks that are poorly matched with student ability (e.g., Anderson, 1981; Doyle, 1982).

Studies of Time and Learning

Most recent studies of time and learning involve engaged time, reflecting the opinion of many persons that an indisputable relationship has been established between engaged time and amount of learning (Borg, 1980; Harnischfeger & Wiley, 1976; Sirotnik, 1983). However, others are more qualified in their support of this relationship (Husen, 1967; Karweit, 1976; Kepler, 1980).

Problems with Time Research

Part of the problem with studies of time resides in the fact that time measures in many studies have been taken independent of measures of instructional behavior (what and how well are teachers doing), classroom organization, and curriculum task, The early emphasis upon time measures per se (independent of context) were understandable but given extant knowledge and our increased capacity for studying time (i.e., methodological advances in the BTES study), it is time to become more integrative and comprehensive in our research. Clearly, the work by Berliner (1979) shows that more refined measures of time (e.g., academic learning time) are more strongly associated with student achievement than are measures that do not consider the quality of time (e.g., allocated or engaged time).

Among the many reasons that time measures do not predict achievement better is the fact that the curriculum tasks students are assigned can be inappropriate or irrelevant even though students appear to be "engaged." Students often are poorly prepared for seatwork assignments (teachers fail to provide students with an adequate rationale or motivation for doing the work or do not give students adequate procedural directions or sufficient information about the concept being studied), are assigned tasks that fill time but do not logically extend students' understanding of subject matter content, and are not given evaluative feedback about class work (Doyle, 1982). Under such conditions one would not expect time-on-task to predict student achievement.

It is also the case that sometimes students' apparent engagement can be misleading. Peterson and Swing (1982) interviewed students who had been taught a lesson on probability. They found that some students who appeared to be paying attention to lectures or class discussions were actually thinking about other things, such as how they would perform in comparison to other pupils if they were called on. Peterson and Swing found that attending as measured by a student's response to an interview was a better predictor of achievement than attending measures based on classroom observations. Other researchers have also demonstrated the need to study the quality of students' cognitions as well as their direct task behavior (Rohrkemper & Bershon, in press).

Given these problems with time measures, why then do they relate to student achievement? It appears that time measures do consistently relate to student achievement but that this relationship is not always substantial (although these relationships are positive and range from weak to moderate). As has been argued elsewhere (Good & Hinkel, 1982) it is likely that measures of engaged time tend to show at least some correlation with student achievement because even superficial task involvement suggests that (a) the teacher possesses minimal managerial skills, (b) the teacher has negotiated some compliance with students, (c) there is some appar ;reed upon direc-

tion and purpose in the class, and (d) at least some of the time students reflect upon assigned work.

Implications of Research on Time

It now seems clear that the same amount of learning time can have dramatically different consequences, depending upon classroom and individual student factors, and that learning depends upon both student attention and appropriate instruction. Theories of classroom learning (and subsequent studies of time and learning) should be based more on accommodating student diversity in ability and on quality of instruction rather than on allocated time per se. This dynamic view of learning assumes that factors affecting classroom learning vary over time (e.g., student interest, instructional pace) and that on-going events in classrooms affect this variation (e.g., student composition factors, specific subject matter assignments). Time spent on academic tasks is important, but quality of the time expenditure is more important. More research is needed to understand issues associated with quality.

Classroom Management

In the 1960's it was popular to view classroom management as classroom discipline and considerable emphasis was placed upon what to do after students misbehaved. A research paradigm initiated by Kounin (1970) and validated and expanded upon by a number of researchers in the past few years has strongly illustrated that good classroom managers are not sharply differentiated in terms of how they react to student misbehavior. Rather, the key behaviors that distinguish good classroom managers are techniques which prevent misbehavior by eliciting student cooperation and involvement in assigned work.

Kounin (1970) found that withitness, momentum, alerting, accountability, and overlapping were all positively and at least moderately correlated with student involvement in classroom lessons. Kounin's basic findings have been expanded somewhat. For example, researchers have subsequently noted that teachers can alert or engage in too much accountability as well as too little. Fundamentally, however, Kounin's work has been consistently replicated by follow-up research and remains an important source of information about classroom management.

Emmer, Evertson, and Anderson (1980) studies 27 third-grade teachers during the first week of school as well as throughout the remainder of the year. These investigators attempted to identify teachers who had comparable classes at the beginning of the year but differed in their management effectiveness (degree of student involvement in lessons) during the year. The findings of this study suggest that the form of the management system is not as important as

the quality with which it is implemented. The authors found that what distinguished the more effective managers was the degree to which the rules and procedures were integrated into a workable system and how effectively the system was taught to students. The effective managers were superior primarily because of their clear expectations, commitment to teach these classroom routines, and their systematic follow-through.

Evertson and Anderson (1979) report that better managers were also more careful monitors of student behavior and dealt with misbehavior more quickly than less effective managers. More effective managers alerted students to the behaviors they expect and held students accountable for those behaviors. To the extent that students internalized these rules, they could monitor their own behavior more continuously (e.g., they knew when and how to get help from other students about missed assignments). Communicating classroom norms for conduct and procedures not only makes the individual learner more efficient (e.g., minimal time wondering about when or how to approach the teacher for feedback), it also minimizes the number of situations that demand complex management skills.

Why Proactive Management Works: Toward a Theory

Teachers who are successful managers start the year by establishing rules and procedures and by communicating expectations for classroom behavior. Other teachers who are ambiguous about their behavioral expectations spend much time attempting to clarify expectations. Students in these teachers' classes may spend considerable time wondering (sometimes justly so) whether their behavior is inappropriate or not. In effective managers' rooms it is thus easier to know what is expected; and it is easier for students and teachers to monitor classroom behavior because they can distinguish appropriate from inappropriate behavior.

It is important that teachers who establish rules actively monitor and deal with inappropriate behavior (especially serious misbehavior). Effective managers may therefore sanction more behavior during the first three or four days of the year than do other teachers. Because students eventually begin to engage in fewer off-task behaviors, it soon becomes even easier for the teacher to monitor the class (few disruptions to attend to) and to sanction behavior appropriately (e.g., correct the right student for his/her misbehavior). Failure to follow up on inattentive, disruptive behavior suggests to students that the teacher is not serious about maintaining rules and such behavior encourages students to do as they please. Similarly, a teacher who consistently reprimands the wrong student (e.g., a student who did not misbehave or a student who joined but did not initiate the misbehavior) indicates to students that he/she does not have the skills to maintain a management system (why not misbehave if you're as likely to be sanctioned for misbehavior when attending to assigned tasks as you are when actually

misbehaving?). If teachers exhibit a lack of purpose, and/or a lack of interest in maintaining a management system, it is likely that students will ignore the teacher and classroom rules much of the time.

If teachers establish reasonable and workable rules, hold positive expectations for student participation in those rules, and insist upon appropriate behavior when necessary, I believe that students will understand the teacher's seriousness and purposefulness about classroom management and will begin to internalize classroom rules, expectations, and procedures.

In addition to establishing procedural and behavioral expectations, teachers must also demand that students use their time to complete curriculum tasks. Effective managers assume that students will complete assignments and hold students accountable for work. Students know what to do when they finish assignments and do not waste time trying to determine the next step. That is, effective managers construct classroom environments in which expectations for student behavior are continuous.

In some classrooms teachers make it difficult for students (as well as teachers) to monitor their own behavior. For example, following a demonstration lesson such a teacher might assign seatwork but say, "If you work now you won't have homework." Such statements and expectations make students' classroom role ambiguous. Presumably, students can do the work now or later. Hence, when students choose not to do seatwork it is difficult to tell if their behavior is appropriate or inappropriate. Furthermore, there is the question of what these students will do while other pupils are likely engaged in seatwork.

In contrast, more effective managers are likely to make a transition from demonstration to seatwork in the following way. "Now you do problems 15-30 at your desks. In ten minutes we will check to see what progress you have made and correct any problems we encounter. If you have difficulty with a problem do the next one and I'll be around to help you. Get started now." Here the students' role is clear; under all conditions they should be attempting to do assigned work...even if they encounter difficulty they know to proceed to the next problem.

In essence, a good management system announces intentions and makes it possible to actively monitor teacher and student behavior to see if progress is being made in shared goals. Such information increases the understanding of students who are intrinsically motivated by school tasks and of teachers concerning how to proceed and do well in the classroom. A management system helps to establish the conditions necessary for students without these orientations to learn self-control and to engage in academic tasks. These students come to understand that classroom rewards and privileges are associated with personal progress on assigned tasks. Without highly developed

management skills a teacher will rely on simplistic and routine assignments which elicit cooperation from students (Doyle, 1982).

As students become older, there should be less need for teachers to remind them of what behavior is appropriate. Still, students at all ages should have an understanding of what constitutes appropriate work and behavior. Students also need feedback about their progress on self-chosen goals as well as information on goals established by the teacher. After students have developed appropriate learning expectations and independent work skills (they believe they can do assigned seatwork, know when they are confused, and know how to obtain information), then teachers can reasonably require students to work more independently (students work for extended time periods without feedback) and assign them more complex tasks (projects that do not have one acceptable answer).

Good management skills provide a necessary, but not sufficient, structure for active classroom learning. I believe that poorly managed classes inhibit students' involvement in the instructional program and negatively affect learning outcomes. The correlational evidence relating the management behaviors reviewed here to student achievement is very consistent and the obtained relationships are typically at least moderate (Brophy, 1983). Furthermore, there is increasing experimental evidence that the managerial principles discussed above can be taught to teachers, who can use them to improve student attention to assigned work (e.g., Anderson, Evertson, & Brophy, 1979; Brophy, 1983; Good, Grouws, & Ebmeier, 1983).

Recent research on management is important but it, like the research on time, yields guidelines not answers. A good illustration of the potential problem with blind application of findings can be seen in data reported by Doyle (1983). He found that it was possible to identify some teachers who were poor managers (using process-product research criteria) but who obtained high student achievement.

Teacher Expectations

Much of the research conducted in the 1970's consisted of classroom observational studies aimed at determining what teachers <u>do</u> in their interactions with high- and low-achieving students. The extent to which teachers differentiate in their behavior toward students has been found to represent an individual difference variable, with some teachers varying their behavior more than others (Brophy & Good, 1974; Cooper & Good, 1983).

Although the causes of differential interaction are not definitely established, it is clear that many teachers vary sharply in their interaction patterns with high- and low-achieving students. Teachers differentiate their behavior toward students they perceive as high or low achievers in a variety of ways. (See Appendix 1 for a

list of some of the more common behavior. For a comprehensive discussion of these variables, see Good & Brophy, 1978, 1984).

Data from the extensive empirical and conceptual work in the area of teacher expectations research do not yield rules concerning teacher behavior toward high and low achievers. It is important to accept the fact that teachers can expect too much or too little in their instructional assignment interactions with students. This dilemma also has to be addressed by curriculum specialists who write textbooks and by policymakers. There are many instances in which teachers need, for example, to assign different types of material to high and low achievers. Teachers can also make instructional mistakes by treating students too much alike, as well as too differently. Observational studies of classrooms suggest that the problem varies from classroom to classroom. Hence, simple rules like increase "wait time" for "lows" will do more harm than good (i.e., some teachers are already waiting an appropriate length of time).

As I point out elsewhere (Good, 1983, in press), because the variables that affect teaching and learning are numerous, complex, and interrelated, knowledge of concepts related to teacher expectation effects is best provided along with judgmental and decision-making skills about its appropriate use. Teachers should not be given a list of behaviors they need to routinely perform. Information about expectation effects has to be combined with extensive knowledge about how children learn as well as knowledge of child development if such information is to be used appropriately.

Teacher Effectiveness Research: Active Teaching

Concern with what teachers actually do in the classroom led many researchers to focus on how teachers interacted with high- and low-achieving students. An incidental outcome of this research was the demonstration that teachers vary greatly across classrooms in their behavior, as well as in how they distribute their time and resources within classrooms.

Our initial research on this problem began with a sample of over 100 third- and fourth-grade teachers. Looking at test scores over a 3-year period, we found that teachers varied considerably in their impact on students' learning, despite the fact that they were using the same textbook and in most cases were teaching comparable students. Our initial data were a demonstration of an apparent teacher effect. Some teachers produced much more mathematics learning than did other teachers teaching in comparable settings.

We felt that observing teachers who had a stable and relatively high or low level of effectiveness would be an excellent basis for estimating the relative value of different teaching behaviors. Hence, our observational research focused upon teachers who were consistently high and low across several consecutive years in their

ability to produce student performance on standardized achievement tests. We found that stable, high and low teachers differed in their classroom behavior (for details see Good, Grouws, & Ebmeier, 1983).

Although we were pleased with the naturalistic findings in that they provided some clear contrasts between relatively high and low gain classrooms, we felt that it was important to determine whether a more direct association could be established between the behaviors that were identified in our observational, naturalistic study and student achievement.

In particular, we wanted to see if we could instruct teachers to behave in ways consistent with the behavior of high gain teachers and to determine what, if any, impact such behavior would have on student achievement. Because of the expense involved in field testing the program, we wanted it to be as comprehensive as possible. Thus, in addition to including the contrast obtained in our earlier naturalistic studies, we tested some of the promising findings from other teacher effectiveness studies as well as our understanding of what some effective teachers were doing. That is, we were not tied completely to the group average obtained in the naturalistic study. Writing the training program resulted in a 45-page manual for teachers. The program, as pointed out elsewhere (Good & Grouws, 1979), is a system of instruction: (a) instructional activity is initiated and reviewed in the context of meaning; (b) students are prepared for each lesson stage to enhance involvement and to minimize errors; (c) the principles of distributed and successful practice are built into the program; (d) active teaching is demanded, especially in the developmental portion of the lesson (when the teacher explains the concept being studied, its importance, etc.). See Appendix 2 and 3 for an example of the organizational structure associated with the program (for complete details of the training program see Good, Grouws, & Ebmeier, 1983).

Pre- and post-testing with the standardized achievement and content referenced tests indicated that after 2 1/2 months of the program, the performance of students in experimental classrooms was considerably higher than those in control classrooms. It was also found that experimental students reported significantly more favorable attitudes at the end of the experiment than did control students. Also, research at the junior high level suggests that secondary teachers can implement the program with positive impact on certain aspects of students' mathematics achievement (Good, Grouws, & Ebmeier, 1983).

Our research on mathematics instruction, especially at the elementary school level, has convinced us that teachers do make a difference in student learning, and that inservice teachers can be trained in such a way that student performance can be increased. The system of instruction that we see as important can be broadly characterized as active teaching. It is instructi[illegible] to note that in our experimental work active teaching was an important difference between

teachers who were getting good achievement gains and those who were getting lower-than-expected gains. Teachers whose students made higher gains were much more active in presenting concepts, explaining the meanings of those concepts, providing appropriate practice activities, and monitoring those activities prior to assigning seatwork. The fact that these teachers appeared to look for ways to confirm or disconfirm that their presentations had been comprehended by students was particularly important. They assumed partial responsibility for student learning and appeared to be ready to reteach when necessary.

In contrast, teachers who were getting lower gains tended to rely much more on seatwork activities and often their students were doing work without a good conceptual understanding of what they were doing and why. In some cases students did not receive adequate procedural instructions for seatwork and teachers appeared to ignore signs from students that indicated either procedural or substantive misunderstanding.

Qualifications

One important consideration is that in a variety of studies using the Missouri Mathematics Program, experimental groups have done better than related control groups. However, the magnitude and importance of the differences are more evident for some teacher and student combinations than others. It is clear that certain types of students and teachers together tend to do better using the treatment than do other combinations of students and teachers (Ebmeier & Good, 1979). The effects of the program on some teacher-student combinations have been replicated by Janicki and Peterson (1981). It also seems that the classroom organizational structure interacts with the effects of the instructional treatment (Ebmeier, Good, & Grouws, 1980).

It should be evident that there is no single system for presenting mathematics concepts effectively (organizational structure does not predict effectiveness). For example, some of the control teachers in our studies have obtained high levels of student achievement using instructional systems that differ from those presented in the program we have developed. More information about the classroom contexts and particular combinations of teachers and students that make the program more or less effective is needed. Research on other outcome measures such as problem solving and estimation should also be conducted (see Reys & Bestgen, 1981 for a good discussion of estimation skills), and it is important that outcomes other than subject-matter mastery be explored as important events per se in addition to seeing if gains in achievement come at the expense of other important outcomes (for a good discussion on teaching self-control see Anderson & Prawat, 1983).

Still, it is satisfying to see that the instructional program we have developed (and programs developed by others) seems to be a

viable system that teachers are willing to implement, and that it positively influences student achievement. We now need to know much more about <u>why</u> some teachers implement the system more extensively than others and what local school features (including student characteristics and classroom structure) lead to greater levels of implementation. In particular, it will be necessary to study both naturalistically and experimentally mathematics teachers who use individualized and small-group practices more successfully than do other teachers.

I suspect that many aspects of the model will be present in individualized and small-group organizational structures; however, some new format variables will likely emerge from such studies. Research on teacher effectiveness in other organizational structures will clearly be of considerable value in theory building, and also in understanding why certain patterns of classroom process are helpful for certain students as they learn particular concepts.

Specific Teacher Behaviors

This section of the paper is drawn from a comprehensive review of the literature (Brophy & Good, in press) and summarizes some of the more specific conclusions that can be drawn from the extant literature about teacher behaviors that maximize student achievement. These conclusions are presented first as three general aspects of teaching and then information for handling specific lesson parts is discussed. However, it is important to emphasize again that these conclusions cannot be equated with teacher effectiveness.

Quantity and Pacing of Instruction

The most consistently replicated findings link achievement to the quantity and pacing of instruction. Amount learned is related to opportunity to learn, whether measured in terms of text pages covered or percentage of test items taught through lecture or recitation. Opportunity to learn is determined in part by length of school day and school year, and in part by the variables discussed below.

<u>Role definition/expectations/time allocation.</u> Achievement is maximized when teachers emphasize academic instruction as a major part of their role, expect students to master the curriculum, and allocate most of the available time to curriculum-related activities. This is seen in relationships involving measures of teachers' role definitions and expectations, high-inference ratings of the degree to which teachers are businesslike or task-oriented, and low-inference measures of time allocated to academic activities rather than to activities with other objectives.

<u>Classroom management/student engaged time.</u> Not all time allocated to academic activities is actually spent engaged in these

activities. Engagement rates depend on the teacher's ability to organize and manage the classroom as an efficient learning environment where academic activities run smoothly, transitions are brief and orderly, and little time is spent getting organized or dealing with inattention or resistance, as noted earlier in this paper. Key indicators of effective management include: good preparation of the classroom and installation of rules and procedures at the beginning of the year, withitness and overlapping in general interaction with students, smoothness and momentum in lesson pacing, variety and appropriate level of challenge in assignments, consistent accountability procedures and follow-up concerning seatwork, and clarity about when and how students can get help and about what options are available when they finish. Extended practical discussions of these variables are presented elsewhere (Good & Brophy, 1984).

Consistent success/academic learning time. To learn efficiently, students must be engaged in activities that are appropriate in difficulty level and otherwise suited to their current achievement levels and needs. It is important not only to maximize content coverage by pacing the students briskly through the curriculum, but also to see that they make continuous progress all along the way, moving through small steps with high rates of success and minimal confusion or frustration. If lessons are to run smoothly without loss of momentum and students are to work on assignments with high levels of success, teachers must be effective in diagnosing learning needs and prescribing appropriate activities. Their questions must usually yield correct answers (about 75% of the time) and seldom yield no response at all, and seatwork activities must be completed with 90 to 100% success by most students. Appropriate seatwork will extend knowledge and provide needed practice, but it will also be "doable" because it is at the correct difficulty level and because students have been prepared for it. Thus, the high success rates result from effort and thought, not mere "automatic" application of already overlearned algorithms. Continuous progress at high rates of success, carried to the point that performance objectives can be met smoothly and rapidly, is especially important in the early grades and whenever students are learning basic knowledge or skills that will be applied later in higher-level activities.

Active teaching. Students achieve more in classes where they spend most of their time being taught or supervised by their teachers rather than working on their own (or not working at all). These classes include frequent lessons (whole-class or small-group, depending on grade level and subject matter) in which the teacher presents information and develops concepts through lecture and demonstration, elaborates this information in the feedback given following responses to recitation or discussion questions, prepares the students for follow-up seatwork activities by giving instructions and going through practice examples, monitors progress on assignments after releasing the students to work independently, and follows up with appropriate feedback and reteaching when necessary. The teacher

conveys the content to the students rather than depending on the curriculum materials to do so, but conveys information mostly in brief presentations followed by recitation or application opportunities. There is a great deal of teacher talk, but most of it is academic rather than procedural or managerial, and much of it involves asking questions and giving feedback rather than extended lecturing.

The findings summarized above deal primarily with quantity of academic activity, particularly the time spent in organized lessons and supervised seatwork. The following variables concern the form and quality of teachers' organized lessons.

Giving Information

Variables of lesson form and quality can be divided into those which involve giving information (structuring), asking questions (soliciting), and providing feedback (reacting). The following variables apply to the function of giving information.

Structuring. Achievement is maximized when teachers not only actively present material, but structure it by: beginning with overviews, advance organizers, or review of objectives; outlining the content and signaling transitions between lesson parts; calling attention to main ideas; summarizing subparts of the lesson as it proceeds; and reviewing main ideas at the end.

Redundancy/sequencing. Achievement is higher when information is presented with a degree of redundancy, particularly in the form of repeating and reviewing general rules and key concepts. In general, structuring, redundancy, and sequencing affect what is learned from listening to verbal presentations, even though they are not powerful determinants of learning from reading text.

Clarity. Clarity of presentation is a consistent correlate of achievement, whether measured by high-inference ratings or low-inference indicators such as absence of "vagueness terms" or "mazes." Knowledge about factors that detract from clarity needs to be supplemented with knowledge about positive factors that enhance clarity, but in any case, students learn more from clear presentations than from unclear ones.

Enthusiasm. Enthusiasm, usually measured by high-inference ratings, appears to be more related to affective than to cognitive outcomes. Nevertheless, it often correlates with achievement, especially for older students.

Pacing/wait-time. "Pacing" usually refers to the solicitation aspects of lessons, but it can also refer to the rate of presentation of information during initial structuring. Although few studies have addressed the matter directly, data from the early grades seem to

favor rapid pacing, both because this helps maintain lesson momentum (and thus minimizes inattention) and because such pacing seems to suit the basic skills learning that occurs at these grade levels. Typically, teacher presentations are short and interspersed with recitation or practice opportunities. At higher grade levels, however, where teachers make longer presentations on more abstract or complex content, it may be necessary to move at a slower pace, allowing time for each new concept to "sink in."

Questioning the Students

The variables in this section concern the teacher's management of public response opportunities during recitations and discussions.

Difficulty level of questions. Data on difficulty level of questions continue to yield mixed results. It seems clear that most (perhaps three-fourths) of teachers' questions should elicit correct answers, and that most of the rest should elicit overt, substantive responses (incorrect or incomplete answers) rather than failures to respond at all. Beyond these generalities, optimal question difficulty probably varies with context. Basic skills instruction requires a great deal of drill and practice, and thus frequent fast-paced drill/review lessons during which most questions are answered rapidly and correctly. However, when teaching complex cognitive content or when trying to stimulate students to generalize from, evaluate, or apply their learning, teachers will need to raise questions that few students can answer correctly (as well as questions that have no single correct answer).

Cognitive level of questions. The cognitive level of a question is conceptually separate from its difficulty level. Extant data refute the simplistic (but frequently assumed) notion that higher-level questions are categorically better than lower-level questions. Several studies indicate that lower-level questions facilitate learning, even learning of higher-level objectives. Furthermore, even when the frequency of higher-level questions correlates positively with achievement, the absolute numbers on which these correlations are based typically show that only about 25% of the questions asked were classified as higher level. Thus, in general, we should expect teachers to ask more lower-level than higher-level questions, even when dealing with higher-level content and seeking to promote higher-level objectives.

Clarity of questions. Teachers can train students to answer by showing a willingness to wait for the answer; however, clarity of question is also a factor. Students sometimes cannot respond because questions are vague or ambiguous, or because the teacher asks two or more questions without stopping to get an answer to the first one.

Post-question wait-time. Studies of science instruction have shown that students achieve better when teachers pause for about

three seconds (rather than one second or less) after questions, to give the students time to think before calling on one of them. This variable has not been addressed in other contexts. It seems likely, however, that length of pause following questions should vary directly with their difficulty level and especially their complexity or cognitive level. A question calling for application of abstract principles should require a longer pause than a factual question.

Waiting for students to respond. Once teachers do call on students (especially nonvolunteers), they usually should wait until the students offer a substantive response, ask for help or clarification, or overtly say "I don't know." Sometimes, however, especially in whole-class lessons where lengthy pauses threaten continuity or momentum, it will be necessary for the teacher to curtail the pause by making a response.

Reacting to Student Responses

Once the teacher has asked a question and called on a student to answer, the teacher then must monitor the student's response ((or lack of it) and react to to.

Reactions to correct responses. Correct responses should be acknowledged as such because, even if the respondent knows that the answer is correct, some of the onlookers may not. Ordinarily (perhaps 90% of the time) this acknowledgement should take the form of overt feedback which may range from brief head nods through short affirmation statements ("right," "yes") or repetition of the answer, to more extensive praise or elaboration of the answer.

Reacting to partly correct responses. Following responses that are incomplete or only partly correct, teachers ordinarily should affirm the correct part and then follow up by giving clues or rephrasing the question. If this does not succeed, the teacher can give the answer or call on another student.

Reacting to incorrect responses. Following incorrect answers, teachers should begin by indicating that the response is not correct. After indicating that the answer was incorrect, teachers usually should try to elicit an improved response by rephrasing the question or giving clues. Such response improvement attempts are likely to be facilitative when they are generally successful, but teachers should avoid "pointless pumping" in situations where questions cannot be broken down or the student is too confused or anxious to profit from further questioning.

Sometimes the feedback following an incorrect answer should include not only the correct answer but a more extended explanation of why the answer is correct or how it can be determined from the information given. Such extended explanation should be included in the feedback whenever the respondent (or others in the class) might

not "get the point" from hearing the answer alone, as well as at times when a review or summary of part of the lesson is needed.

Reacting to "no response". Teachers should train their students to respond overtly to questions, even if only to say "I don't know." Thus, if waiting has not produced an overt response, they should probe ("Do you know?"), elicit an overt response, and then follow up by giving feedback, supplying the answer, or calling on someone else (depending on the student's response to the probe).

Reacting to student questions and comments. Teachers should answer relevant student questions or redirect them to the class, and incorporate relevant student comments into the lesson. Such use of student ideas appears to become more important with each succeeding grade level, as students become both more able to contribute useful ideas and more sensitive to whether teachers treat their ideas with interest and respect.

Handling Seatwork and Homework Assignments

Although independent seatwork is probably overused and is not a substitute for active teacher instruction or for drill/recitation/discussion opportunities, seatwork (and homework) assignments provide needed practice and application opportunities. Ideally, such assignments will be varied and interesting enough to motivate student engagement, new or challenging enough to constitute meaningful learning experiences rather than pointless busywork, and yet easy enough to allow success with reasonable effort.

Students should know that work they are accountable for, how to get help when they need it, and what to do when they finish. Performance should be monitored for completion and accuracy, and students should receive timely and specific feedback. If the whole class or group has the same assignment, review of the assignment can be part of the next day's lesson. Other assignments will require more individualized feedback. If performance is poor, teachers should provide not only feedback but reteaching and follow-up assignments designed to insure that the material is mastered.

Conclusion

First, we can conclude that recent classroom research has produced rich empirical findings and concepts that have considerable potential to affect classroom practice. In the last decade researchers have produced direct evidence to refute the myth that teachers do not make a difference. This is important information in relation to policy, because it indicates that teachers are a vital investment. Furthermore, we have gained new models for analyzing instruction, models that are valuable to practitioners. However, we need to know

much more about the quality and combinations of teaching processes that are associated with increases in student achievement.

A second conclusion is that recent classroom research findings need to be systematically disseminated in teacher education programs, although such information should be presented in a decision-making format that enables students to examine concepts and to apply them to unique settings (for a good illustration of this idea, see Amarel, 1981 and Good & Brophy 1978, 1984). Teacher training programs should not encourage students to make literal and unalterable interpretations of concepts and research findings. We know that there can be too much as well as too little alerting or accountability (or any other variable).

To articulate and successfully implement a teacher education program that carefully combines process skills, research insights, and subject matter knowledge that enables teachers to become active decision makers is in itself a massive step that merits systematic study. Translation of research findings into recommendations for practice is a very difficult task and one which is often ignored in teacher education programs. Still, we must convey to teachers that learning is problematic because classroom problems and contexts vary. Teachers must also know that concepts and findings from research yield greater awareness of problems and alternative ways for solving them, but do not offer answers to educational problems.

A good example of the need to use classroom research findings as tools rather than answers can be seen in Adams and Biddle's (1970) discussion of the "action zone." They found that students who sat in the middle-front-row seats and in seats extending directly up the middle aisle received more opportunities to talk in class than did other students. This research is valuable, and it suggests that there may be areas of a classroom where students receive more response opportunities than students in other areas. However, this study could be interpreted too literally, as implying that teachers and/or classroom observers should pay most attention to what takes place in the front row and the middle of a classroom.

Recent data collected by Alhajri (1981) show the utility of viewing the action zone as a concept rather than a generalized phenomenon. In 32 classrooms the investigator found only one that had an action zone like that described by Adams and Biddle; however, Alhajri found many classrooms in which some kind of action zone was present. If observers or teachers were monitoring classes for only one type of action zone, they would not have perceived the action zones that were present in these classrooms because they took a different form.

A third general conclusion deals with consolidating and enhancing progress in classroom research through new research. I believe that research needs to become more comprehensive than it has in the past. Past research has examined single variables of schooling such as the curriculum, or teachers, or students. As stated earlier, if

research is to be effective, its context must be focused. However, within the particulars of a single study (e.g., middle school science classes), research needs to become more comprehensive. If classroom learning is to be improved and/or understood, future studies must describe the concepts and subject matter issues being examined as well as how teachers and students think and behave when they study these concepts. Finally, I believe that we must consider more seriously the meanings of findings and their relationship to practice than we have traditionally done. We must attempt to understand as well as to describe and to generate theories and explanations as well as concepts and findings.

APPENDIX 1

COMMUNICATION OF LOW EXPECTATIONS

1. Calling on lows less often to answer classroom questions or make public demonstrations.
2. Waiting less time for lows to answer questions.
3. Praising lows less frequently than highs after successful public responses.
4. Criticizing lows more frequently than highs for incorrect public responses.
5. Not staying with lows in failure situations (providing clues, asking follow-up questions).
6. Seating slow students farther from the teacher or in a group (making it harder to monitor low-achieving students or treat them as individuals).
7. Paying less attention to lows in academic situations (smiling less often and maintaining less eye contact).
8. Praising lows more frequently than highs for marginal or inadequate public responses.
9. Providing low-achieving students with less accurate and less detailed feedback than highs.
10. Failing to provide lows with feedback about their responses more frequently than highs.
11. Demanding less work and effort from lows than from highs.
12. Interrupting the performance of low achievers more frequently than that of high achievers.
13. Organizing assignments for lows around drill and practice in contrast to the organization of assignments for highs around meaning and concepts.

For additional information about the ways in which teachers communicate expectations to students, see Good, T. and Brophy J. Looking in classroom. New York: Harper & Rowe.

APPENDIX 2

SUMMARY OF KEY INSTRUCTIONAL BEHAVIORS

Daily Review (first 8 minutes except Mondays)

1. Review the concepts and skills associated with the homework.
2. Collect and deal with homework assignments.
3. Ask several mental computation exercises.

Development (about 20 minutes)

1. Briefly focus on prerequisite skills and concepts.
2. Focus on meaning and promoting student understanding by using lively explanations, demonstrations, process explanations, illustrations, etc.
3. Assess student comprehension
   a. Using process/product questions (active interaction),
   b. Using controlled practice.
4. Repeat and elaborate on the meaning portion as necessary.

Seatwork (about 15 minutes)

1. Provide uninterrupted successful practice.
2. Momentum--keep the ball rolling--get everyone involved, then sustain involvement.
3. Alerting--let students know their work will be checked at end of period.
4. Accountability--check the students' work.

Homework Assignment

1. Assigning on a regular basis at the end of each math class except Fridays.
2. Should involve about 15 minutes of work to be done at home.
3. Should include one or two review problems.

Special Review

1. Weekly review/maintenance
   a. Conduct during the first 20 minutes each Monday.
   b. Focus on skills and concepts covered during the previous week.
2. Monthly review/maintenance
   a. Conduct every fourth Monday.
   b. Focus on skills and concepts covered since the last monthly review.

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"Teachers need a clear idea of what behaviors are and are not appropriate in their classrooms. Without such expectations, they are subject to the behavioral idiosyncracies of particular students, they run the risk of being inconsistent, and they may allow behaviors to be established that are incompatible with productive use of classroom time."

"Identifying expectations for behavior is not simply a matter of listing a set of rules for students. Instead, it involves a process of conceptualizing the nature of activities that will occur in the classroom and identifying how students should behave in these activities in order for a smoothly functioning class to occur."

CURRENT RESEARCH ON EFFECTIVE CLASSROOM MANAGEMENT

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This presentation* will give an overview of research on classroom management, emphasizing results from a program of research conducted at the Research and Development Center for Teacher Education during the past 5 years. These studies, along with other investigations of classroom management, provide a basis for describing important dimensions of teacher behavior that account for well-managed classrooms. It should be emphasized that this is an overview, not a complete description of all classroom management tasks. Thoughtful perspectives on managing classrooms can be found in books edited by Duke (1979, 1982) and in a paper by Brophy (1983). Detailed descriptions of skills for managing elementary classrooms can be found in Evertson, Emmer, Clements, Sanford, and Worsham (1984); and for secondary classrooms, in Emmer, Evertson, Sanford, Clements, and Worsham (1984).

We began studying classroom management for several reasons. One was that process/product research conducted at our Center (e.g., see Brophy & Evertson, 1976) had identified effective classroom management as a consistent predictor of student achievement. To illustrate, consider the results of one analysis of a study of 29 seventh- and eighth-grade math teachers (Evertson, Emmer & Brophy, 1980). For this analysis, a subset of three highly effective teachers and six relatively ineffective teachers was identified based on student learning gains over the course of a year on a district-administered achievement test and on the basis of student attitudes as measured by a questionnaire given at the end of the school year to each teacher's students. Extensive observation data were obtained in each class by observers who had no knowledge of any results regarding student achievement or attitude. A comparison of the two sets of teachers on classroom behavior measures indicated numerous significant mean differences ($p < .05$). Examples of variables are listed below:

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Teacher consistently enforces rules;
Amount of disturbance teacher accepts;
Monitoring of class;
Efficiency of transitions;
Students respect teacher;
Amount of productive time; and
Students obey teacher.

Except for the second variable, assessments indicated higher scores for more effective teachers. This sample of the variables which showed differences clearly indicates aspects of teacher behavior that are related to a management function. Not all variables showed differences between the two groups. Assessments on variables listed below showed no differences:

Attractiveness of room;
Democratic leadership;
Teacher socializes with students;
Teacher showmanship;
Emphasis on grades; and
Teacher's command of subject.

Of course, finding no difference between these two groups does not mean that the variables are necessarily unimportant. For example, none of the teachers were judged to have poor command of their subject, so that both groups' assessments in this area were high. The point is simply that the teachers were not different on all variables, but there were reliable differences on variables related to a dimension that can be characterized as classroom management effectiveness.

This result was not an isolated finding. A number of other process/product research studies had also found variables in the domain of classroom management to be related to student learning gains. Summaries of the literature identifying such variables are provided by Medley (1977) and Good (1979).

Another reason for studying classroom management has to do with its centrality to the role of a teacher. A major part of the task of teaching is to manage a classroom; that is, to prepare the setting, to organize activities, to arrange students in that setting, and to engage children in whatever activities are appropriate to master the curriculum objectives (see Doyle, 1979, for an insightful discussion of teacher and student roles in management).

A third reason for studying classroom management is the absence of a unified conception of it in the teacher-preparation curriculum. Courses devoted primarily to classroom management are generally not included in the required teacher-education curriculum, and management tends to be considered diffusely throughout the program. It was hoped that more pragmatic research might build a firmer base for this aspect of teacher education.

Criteria for Effective Management

Our research program and numerous studies of classroom management have used several criteria for judging whether a classroom is effectively managed. The typical approach is to define management in terms of observable student behavior rather than an *a priori* conception of what an effective manager does. Two types of student behaviors are frequently used. One is the degree of disruptive behavior exhibited by one or more students in a classroom. Disruptive behavior, by definition, interferes with the teacher or other students, and teachers take a very dim view of it. Related variables include: deviant behavior, unsanctioned, off-task behavior, and aggressive behavior. A second type of student behavior frequently used as a criterion in management research is the degree to which students are appropriately engaged in classroom activities. Engagement rate reflects the degree to which students are involved in whatever activities are identified as appropriate for the content or learning objectives in the curriculum. Related terms include: attentive behavior, student involvement, and on-task behavior. Studies that use both criteria simultaneously in classrooms have reported moderate correlations between the two types of variables, suggesting that although related, each variable contains some unique information about the setting. The use of these criteria for effective management, while logically defensible by virtue of the teacher's role in maintaining an orderly and appropriate environment for learning, also has empirical support. These variables have been found to predict student achievement gains (For example, see reviews in Bloom, 1976; Jackson, 1968; and by Hoge and Luce, 1979).

A Conception of Classroom Management Task

Classroom management can be described as a series of activities directed at establishing a setting in which students engage in learning activities designated by the teacher and in which disruptive behavior is kept at a minimum. There are three major phases to the process of establishing and maintaining a well-managed classroom.

Pre-active phase. This phase of classroom management occurs prior to the arrival of students and consists of preparing the physical setting, planning beginning of year activities, and identifying expectations for student behavior and for work requirements.

Beginning the year. The second phase in classroom management occurs when students arrive. During this phase the teacher communicates expectations to students, establishes norms for behavior and work, and establishes routines and procedures for conducting activities. Depending upon the age and grade level of students, this phase may take anywhere from a few days to several weeks to complete.

Remainder of year. In the third phase of classroom management, the emphasis is on maintaining norms for behavior and work. During

this stage the emphasis in management shifts from socialization of students into the classroom setting to designing and conducting activities in ways that keep students actively engaged. Provisions for student success and adapting instruction to meet individual student needs (especially lower-achieving students) are critical in this stage.

No implication is intended that the planning activities in phase one and the norm-setting activities in phase two do not occur at times other than at the beginning of the year. Certainly, new procedures can be introduced at other times, and changes in the physical setting or behavior norms can and do occur. However, our experience in observing many classrooms at the beginning and throughout the year is that, in most cases, the major share of activities in these areas occurs as described above.

Major Components of the Pre-Active Phase

There is a growing research literature dealing with teacher planning and decision making (cf. Shavelson and Stern, 1981). However, most of this literature is descriptive rather than an attempt to identify planning characteristics of teachers identified as effective according to some criteria. Thus, although we regard the pre-active phase of management as important, its processes are revealed only sketchily by research. Generally, teacher planning appears to focus around the identification of suitable classroom activities and be more influenced by the context (i.e., the nature of students, available material) and student motivation or involvement than by learning outcomes. That is, teachers do not plan instruction starting with learning objectives and proceeding systematically to examine methods for attaining those objectives. The research on teacher planning for the beginning of the year is much sparser than research on planning generally, and does not provide a basis for specific recommendations. Descriptive studies have indicated that much teacher activity during the week before school begins is directed at room preparation, reviewing and organizing files and materials, and identifying a schedule of activities. How teachers form expectations for student behavior, decide on what activities are appropriate for beginning of year, and match student work requirements with entering-student capabilities are not researched in the context of beginning of year. One study did examine teacher activities and plans for the first day of school, using 11 relatively inexperienced middle-school teachers (Worsham & Emmer, 1983). In this study teachers had primarily procedural and behavioral concerns (rules and procedures, administrative tasks) for the first day and placed relatively little emphasis on academic or affective components. One interesting finding was that teachers with a more balanced affective and procedural focus had better success in terms of student engagement rates and disruption than teachers who had only a procedural focus on the first day. Affective concerns here refers to activities or plans to make the students feel welcome to the

classroom or become acquainted with the teacher and each other.

Given a sparse literature on effective planning for the beginning of the year, we must infer planning categories from observations of teachers at the beginning of the year. Based on these observations, especially of more effective classroom managers, we can identify a number of areas in which planning should occur and which appear not to be the result of spontaneous teacher behavior. These dimensions are derived mainly from four studies of elementary and junior high teachers (Emmer, Evertson & Anderson, 1980; Evertson & Emmer, 1982; Emmer, Sanford, Evertson, Clements & Martin, 1981; Emmer, Sanford, Clements & Martin, 1982). In these studies about 200 teachers were observed both at the beginning of the year and throughout the year. A variety of observation procedures was used, including frequency counts of behaviors, ratings, extensive narrative descriptions of classroom activities and behavior, and summary ratings and assessments made by observers and readers of the narrative accounts. The categories that appear to discriminate better and poorer managers that are relevant for the beginning of the year include the following:

Room preparation. The key features here are not attractiveness of the room or aspects of decor, but are related to important management considerations, mainly those of monitoring and movement about the room. As will be apparent from a later discussion of teacher management behaviors, the teacher's ability to monitor students is an important component of management. Thus, the room needs to be organized in a way that permits the teacher to observe students easily. This means leaving a clear line of sight from small-group work areas to the rest of the class, avoiding "blind spots" where students can drop from sight, and arranging furniture so that the teacher can easily move about the room to monitor individual students. In addition, students need to be able to see instructional areas without undue turning around or movement, and commonly used materials and areas of the room must be easily accessible.

Although these aspects of room preparation are helpful in creating a setting conducive to good management, we do not wish to overemphasize their importance, nor to produce planning that focuses solely on this aspect of management. Many other aspects of preparing for the beginning of the year require attention.

Identifying expectations for behavior. Teachers need a clear idea of what behaviors are and are not appropriate in their classrooms. Without such expectations, they are subject to the behavioral idiosyncracies of particular students, they run the risk of being inconsistent, and they may allow behaviors to be established that are incompatible with productive use of classroom time. Identifying expectations for behavior is not simply a matter of listing a set of rules for students. Instead, it involves a process of conceptualizing the nature of activities that will occur in the classroom and identifying how students should behave in these activities in order

for a smoothly functioning class to occur. Major categories of activities include: room use, teacher-led instruction including whole-class and small-group instruction, seatwork, student work in groups (as in the laboratory or discussion activities), transitions, and behavior out of the classroom. More effective managers we have observed generally communicate clearer expectations for student behavior in these areas. They frequently do so through establishing specific procedures governing student behavior, that is, by informing students ahead of time what kinds of behaviors are or are not appropriate. To cite some examples, consider expectations for behavior during small-group reading instruction in an elementary classroom. Some critical questions include:

May students call out, or must they raise their hands in the group?

May students who are not in the group (i.e., who are involved in seatwork) talk, or must they remain silent?

If students out of the group are permitted to talk, what kind of volume control will there be, e.g., whispering or "classroom voice"?

What provisions will be maue for students who need help if the teacher is busy?

Under what circumstances may students out of the group leave their seats?

How are students in the group expected to behave?

What should out-of-group students do if they complete their assignments before the end of the activity?

What signal will be used to indicate that another group is being called to the reading-group area?

If the teacher has formed expectations in these areas, then she or he will be in a better position to establish appropriate behavior to begin with, to communicate with students about what they are expected to do, and to prevent problems from occurring. In addition, if the teacher has thought through expectations in these areas, then the teacher is in a better position to monitor students and help them learn how to behave. Time and space do not permit a detailed analysis of each of these major areas. Such discussion can be found in references provided at the end of the paper. From our interviews with teachers it is clear that these expectations for student behavior are not developed in a short period of time. In addition, some teachers, even those with substantial experience, never develop really efficient procedures in certain areas. Their overall management skills are adequate to carry them through without major

problems, but they could benefit from knowledge about other ways to deal with certain aspects of their classroom and its activities.

Managing student work. In addition to expectations for student behavior described in the preceding section, more effective managers usually have clearer expectations for student work. The areas in which these expectations are manifest include the following:

Communicating assignments and work requirements;
Monitoring student progress and completion of assignments;
Provisions for feedback for students.

Within these three major areas specific work requirements vary depending upon the age/grade level of the students and the subject matter being taught. As in the case of procedures and expectations for behavior, specific aspects of managing student work can require careful and thoughtful planning. For example, in the area of communicating assignments, some provision needs to be made for letting students know what the assignments are, such as by posting them in a specific place, developing procedures that will be applicable to a variety of assignments, such as appropriate heading, standards for work, and expectations for incomplete or make-up assignments. In addition, some provision must be made for absent students, identifying what work they missed that must be made up, and for getting any extra help they need.

Establishing appropriate expectations in these areas and developing classroom procedures for managing student work have several important management functions. The expectations reduce uncertainty for the students and provide them with cues for appropriate behavior. Once students have learned the behaviors expected of them, teachers can initiate work activities quickly without needing to explain or spend large amounts of time on procedural details each time. Finally, these procedures simplify the environment for both teachers and students. The reduced complexity means a greater change of smoothly running activities with minimal distractions or interruptions.

Consequences. A fourth major category for planning is deciding upon the consequences for students of their behavior and work in the classroom. We will deal with consequences more fully in the section under the third management phase. However, teachers who plan to utilize extensive reward or penalty systems or who teach in schools where school-wide systems are in effect, must plan their use of these systems carefully. Specifically, the particular rewards and penalties that will be used need to be associated with the specific behaviors for which they will act as consequences.

Beginning the School Year

It is helpful to think of the beginning of the school year as having three major and complementary goals. The first is to acclimate students to their new setting while providing them with a sense of security and lessened anxiety about their ability to perform and to learn. This goal is especially important for younger children and for students with a history of difficulty in academic work. The second goal is to establish an academic content focus so that students accept learning activities as the major purpose for being in school. The third goal is to promote the acceptance of norms for appropriate behavior. In our studies of classroom management, more effective classroom managers have used the first few days of class to state some general expectations, commonly in the context of a discussion or rules for the classroom. In addition, these teachers tend to teach classroom procedures gradually over a period of days or weeks, giving careful explanations of what is expected of students. Examples of areas in which these expectations are communicated were presented in preceding sections. These procedures are usually presented in the context of the activity in which they will be used, rather than taught as isolated components. With younger students, teaching procedures can involve rehearsal or demonstration by the teacher. At all grades, teachers monitor students and give feedback as they begin using procedures. Feedback tends to be focused on whether the students are performing the desired behavior correctly. Not doing so tends to be dealt with supportively by giving further directions to the students or by otherwise helping them understand what is desired. At the elementary level, the communication of expectations and establishment of procedures and appropriate behavior is generally done during the first two weeks of the school year. At early grade levels teachers frequently indicate that it takes three or four weeks before the class has settled into the routines and structure. At the secondary level expectations about work requirements and related matters tend to be more dominant and communicated during the first week of instruction. Expectations for behavior in major procedural areas are still communicated and are important for the conduct of instruction, but usually take less time--students at this level, after all, have participated in school experiences for many years. Teachers at the secondary level typically rely on clear explanations of expectations and prompt feedback to students if they engage in inappropriate behavior, rather than rehearsal or demonstration of behavioral procedures.

Activities at the beginning of the year are, for the most part, content-based but are usually characterized by low risk and high levels of student success. Activities tend to be whole-class focused (teacher-led instruction or seatwork), rather than small groups, individualized, or complex organizational patterns. Whole-class activities enable the teacher to monitor students readily and do not involve the use of complex procedures which might be difficult to teach, in addition to other procedures which must be learned at the beginning of the year. Moreover, activities that are relatively easy

reduce the likelihood of failure and also minimize demands on the teacher's time and attention.

Teacher behavior during the beginning of school in more effectively-managed classes can be characterized by a "take charge" leadership style. These teachers tend to be "front and center" and to maintain contact with students. They are the main source of information about what students are expected to do and they stay actively involved with the students, either by providing directions and instruction, or by monitoring. This does not mean that such teachers behave in a domineering fashion or appear unmindful of students' concerns. In fact, Moskowitz and Hayman (1976) found in their comparison of the first day of teachers rate as "best" by their students compared to first-year teachers, that the best teachers were more accepting of student feelings and ideas on the first day and smiled and joked more. In our studies, poor managers were more likely to give students difficult assignments in the first few days, work at their desks without giving students adequate information or help, fail to monitor students, and otherwise lose contact with the class as a whole (e.g., by spending large amounts of time with individual students).

Phase Three: Maintaining the Management Systems

The remainder of the school year, after students have been initially socialized into the classroom setting, can be viewed as primarily one of maintenance. This, of course, is an oversimplification because aspects of the management system can change and therefore require introduction of new procedures and reorientation of students.

The maintenance of a classroom management system is an active process. A number of characteristics in this process have been identified. Most of these features of effective management are also identifiable during the beginning-of-the-year phase and help establish appropriate behavior to begin with. However, they come to the fore during the maintenance phase and are the primary means by which the classroom system functions smoothly. Without these characteristics, even the most thoughtfully composed set of expectations and the most carefully planned classroom procedures for managing student behavior and work will not be sustained throughout the year. In other words, "well begun" is only half-done.

Monitoring. A major characteristic discriminating more and less effective classroom managers is their monitoring of student behavior, both with respect to following classroom rules and procedures as well as academic performance. Careful monitoring enables the teacher to detect problems in early stages before they develop into major difficulties. Monitoring also gives students quicker access to assistance when they need it. This skill is an important part of the teacher variable Kounin (1070) labeled "withitness," which was operation-

alized as the percentage of teacher "desists" which were correctly targeted and timely (i.e., dealt with the inappropriate behavior before it escalated or spread to other students). This variable was strongly correlated with the degree of on-task student behavior and negatively correlated with amount of deviant behavior.

Prompt handling of inappropriate behavior. A related characteristic to monitoring and another part of "withitness" is prompt handling of inappropriate behavior. Compared to less effective managers, better managers tend to deal with inappropriate behavior rather than ignore it. This component is affected by the teacher's monitoring skills and also because better managers' preventive strategies tend to limit the amount of inappropriate behavior in the first place. It simply is easier to deal with inappropriate behavior when it occurs occasionally than when it is occurring frequently. High rates of inappropriate behavior put the teacher in a dilemma: to deal with the individual behaviors will cause constant interruptions of whole-class or group activities; to ignore the behaviors results in many students not attending to lessons and not understanding the tasks they must do. This is another reason for the importance of establishing a well-managed setting to begin with; it is obviously much easier to maintain a setting in which students are, by and large, behaving appropriately than it is to redirect student behavior that exhibits high levels of disruption of non-involvement.

Procedures for dealing with inappropriate behavior used by better managers tend to be relatively simple and unobtrusive. Thus, it is extremely rare to observe a teacher stopping an ongoing classroom activity to have a conference with an individual student. Likewise, frequent use of penalties is rarely seen. Instead, these teachers rely upon simple procedures, such as focusing class attention on the ongoing task, redirecting student behavior to appropriate activities, citing procedures that students should follow, making eye contact, or simply issuing a mild desist statement, such as mentioning the student's name or asking him or her to stop whatever the inappropriate behavior is.

Reward and feedback systems. Another important component of classroom management for maintaining student behavior is a set of consequences, both rewards and penalties. This area is probably the most researched aspect of management, although much of the literature tends to be small-scale behavior modification studies outside regular classroom settings. Enough of this research has been conducted in regular settings, however, to allow us some confidence in identifying characteristics that can be helpful in maintaining appropriate student behavior.

A commonly occurring consequence is that of teacher approval, recognition, or praise (see Brophy, 1981, for a good review of this area). Recent research has suggested that the effects of teacher approval depend on the student's interpretation of it, and that it is probably most effective when directed at student accomplishment and

effort. If students interpret teacher approval as attempting to control them, then it is not likely to have the desired effect, especially with older children and adolescents. In our observations of classrooms we have noted different levels of reward-and-penalty systems in terms of the amount of effort which teachers are required to expend in establishing and utilizing these systems. The least complex systems are those which rely mainly on teacher approval and the use of grades. Moderate systems involve the use of rewards, such as privileges, recognition awards, such as honor students, badges, and certificates. The most complex systems involve the use of some kind of token economy or chip system which identify specific behaviors that are rewarded and in which students or the class receive rewards based upon their accumulation of tokens. In a similar manner, penalty systems can range from simple to complex. Simple systems utilize the witholding of privileges and teacher disapproval for inappropriate behavior and reductions in grades for poor work. More complex systems can utilize response cost strategies, removal of students from desired activities, as well as a tiered system of time out, contracts, and suspensions. We have observed effective managers using very simple systems as well as complex systems in both areas. Thus, a blanket endorsement of one or another type of reward or penalty system does not seem appropriate. It appears that a minimal system can be used with good effect, but that more complex systems may be helpful in dealing with special problems, such as a class with many students who have poor motivation for academic work or who have experienced considerable prior failure or difficulty in the subject. What does appear to be important, whatever system is used, is that it be used consistently and that students understand what behaviors are rewarded or penalized. Inconsistency, especially in the use of penalties, can quickly undermine complex systems and result in high rates of inappropriate behavior. As several researchers have noted (Sawin and Parke, 1979; Parke and Deur, 1972), inconsistent use of punishment can result in very high levels of aggressive behavior.

Activity structures. Activities can be regarded as a basic unit of classroom life. Doyle (1979, p. 47) notes that "Teachers encounter classrooms as units of time to be filled with activities that can be justified educationally and as groups of students who vary widely in aptitude and propensities for such activities." Student and teacher behavior occurs in the context of classroom activities (or in transitions between activities). Thus, the design and conduct of activities is a critical task for teachers and has great impact on the overall success of the classroom management system.

Important aspects of whole-class and group instruction activities include the degree of clarity of teacher directions and instruction, the pacing of activities to maintain student involvement, and the smoothness (see Kounin 1970) of activities, that is, the degree to which they are free from intrusions and interruptions. In seatwork activities, the match of task- demands to the students' abilities to perform the tasks is an important factor in maintaining

involvement, especially the degree to which materials and activities accommodate lower-achieving students. Another variable identified by Kounin as important for maintaining involvement in seatwork activities is the degree of variety and challenge in the tasks. Finally, the continuity of signals in the activity itself (Kounin & Doyle, 1975; Kounin & Gump, 1974) is important for maintaining involvement. Continuity refers to the degree to which the activity contains, or the teacher provides, prompts, or cues that help students identify next steps. In addition, poor results occur when teachers spend large amounts of time with individual students (Scott & Bushell, 1974). No doubt this reflects both the difficulties in monitoring a whole class when the teacher works with individual students, as well as problems in adapting instruction for particular kinds of students in the class. Finally, transitions between activities or at the beginning and end of a period or day can also be a source of management problems. Arlin (1979) found that the rates of off-task behavior were higher during transitions than during other classroom activities. He also found that when teachers structured transitions (for example, gave students directions about what they were to do, or had a routine for the transition), the inappropriate behavior was no higher than during regular classroom activities.

Summary

Classroom management is viewed as the result of three phases of activity. During a pre-active phase before students arrive, teachers form expectations for student behavior, plan rules and procedures, prepare the classroom setting, and identify initial activities for students. A second phase begins when students arrive and continues for up to several weeks, depending upon the age/grade level of the students. During the beginning-of-year phase, teacher expectations are communicated, students are socialized into the classroom setting, and procedures and routines for classroom activities are begun. During the third phase, occurring throughout the year, the classroom system is maintained by careful teacher monitoring, prompt handling of problems, and carefully designed and conducted activities.

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"Because of linguistic deficiencies and/or lack of awareness of social cues, some students may have much more difficulty convincing teachers that they know the material than do other students."

"Recent research has shown that students may interpret the same teacher behavior in different ways. Hence, those interested in teacher expectation effects have become more interested in student expectations and in how students influence teachers."

RESEARCH ON TEACHER EXPECTATIONS

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I believe that we have made progress in classroom research during the past decade in part because we have started to examine more sophisticated questions. In order to continue this progress we must accept some of the limitations of research and especially the fact that research yields directions and concepts, not answers. Blind application of research findings needs to be discouraged, not only because the nature of any problem varies from class to class, but also because of our limited knowledge about the classroom processes and conditions that facilitate student achievement.

There is much to be learned about the forces that influence classroom thinking, behavior, and outcomes. For example, we have little information about conditions that are associated with achievement in subject areas other than basic skills, and virtually no consistent, reliable data concerning how to stimulate student affective growth. We need to acknowledge that describing and affecting classroom learning is an enormously complex task, and we should be suspicious of simple models of teaching that offer universal solutions to classroom problems. Thus, although I am very encouraged by the recent progress achieved by classroom researchers, I am equally impressed by the complexity of the classroom setting and by unexamined and unanswered questions that confront classroom research and practice.

Still, we know considerably more about classroom teaching than we did a decade ago. In 1973, information about the effects of classroom conditions on student achievement was weak and contradictory. In the ensuing 10 years the literature on basic skill instruction, especially in reading and mathematics, has moved from a state of confusion to a point where several successful field experiments have been conducted. These studies illustrate that teacher behavior can have significant, practical effects upon student achievement.

Extant findings clearly indicate that teachers vary widely in (among other things): (a) how they utilize time in the classroom,

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(b) how they manage classroom activities, (c) how they select and design classroom learning tasks, (d) how actively they teach and communicate with students about classroom learning tasks, and (e) the expectations and academic standards that they hold for themselves, peers, their classes, and for individual students. Not only do teachers vary across these dimensions, but research demonstrates that these aspects of classroom life are related to student achievement. Research also shows that student factors mediate between teaching and learning. A major goal of this paper is to describe research findings in one of these areas. The issue addressed here is the relationship between teacher expectations and student performance.

Teacher Expectations

Teachers vary considerably in how they use time, manage classrooms, mediate textbook and curriculum assignments, and in the extent to which they emphasize either meaning or drill-like activities. However, instructional variation can be found not only between classrooms (e.g., how two teachers vary from one another in their classroom behavior), but also within classrooms (one teacher behaves in different ways toward subgroups of students in his/her class). For instance, some teachers who provide considerable feedback may evenly distribute their evaluative comments to students, but other teachers may provide feedback to only a few students in the class. Although some teachers fail to provide entire classes with appropriate content and stimulation, in many classrooms students perceived by teachers to be low achievers are the ones who receive inadequate instruction.

Much of the research conducted on teacher expectations in the 1970s consisted of classroom observational studies aimed at determining what teachers do in their interactions with high- and low-achieving students. The extent to which teachers differentiate in their behavior toward students has been found to represent an individual difference variable with some teachers varying their behavior more than others (Brophy & Good, 1974; Good & Brophy, 1980). Explanatory variables which indicate when and why teachers are likely to behave differently toward high- and low-achieving students have not been frequently studied (for exceptions see Cooper, 1979; Cooper & Good, 1983). It is not clear whether teachers who differentiate sharply in their behavior toward highs and lows do so because of personality variables (defensiveness, rigidity), school or classroom organizational factors, characteristics that individual pupils and groups of students bring to the classroom or a combination of these and other factors.

Although the causes of differential interaction are not definitely established, it is clear that many teachers vary sharply in their interaction patterns with high- and low-achieving students. Brophy and Good (1974) estimated that one-third of the classroom teachers who have been observed in related research have shown patterns of highly differentiated behavior toward high and low

achievers. Teachers differentiate their behavior toward students they perceive a high or low achievers in a variety of ways. (For a comprehensive discussion of these variables see Cooper & Good, 1983; Good & Brophy, 1978, in press). We will list here only a few of the ways teachers have been found to differ ir their treatment of students: (a) calling on lows less often to answer classroom questions or to make public demonstrations, (b) waiting less time for lows to answer questions, (c) praising lows less frequently than highs after successful public responses, (d) criticizing lows more frequently than highs for incorrect public responses, and (e) not staying with lows in failure situations (providing clues, asking follow-up questions).

It is important to examine the implications of such teacher behaviors for low achievers. It seems that a good strategy for slow students who face such conditions would be not to volunteer or not to respond when called on because such an instructional system discourages students from taking risks. To the extent that students are motivated to reduce risks and ambiguity--and many argue that students are strongly motivated to do so--it seems that students would become more passive in order to reduce the risks of public failure.

Explanations for Differential Teacher Behavior

One basic cause of differential behavior is that classrooms are very busy and complex environments and it is difficult for teachers to accurately assess the frequency and quality of their interactions with individu ' students.

A seconc ·lanation involves the fact that much classroom behavior has ? interpreted before it has meaning. Research (e.g., Anderse· itt, in press) suggests that once a teacher develops an e ation about a student (e.g., the student is not capable of lea ;), the teacher interprets subsequent ambiguous classroom events in a way consistent with the original expectation. Good (1980) maintains that most classroom behavior is ambiguous and subject to multiple interpretations.

A third reason why teachers differentiate more or less in their behavior toward high- and low-achieving students involves the issue of causality. Some teachers believe that they can and will influence student learning (for example, see Brophy & Evertson, 1976). Such teachers may interpret student failure as the need for more instruction, more clarification, and eventually increased opportunity to learn. Other teachers, because they assign blame rather than assume partial responsibility for student failure, may interpret failure as the need to provide less challenge and fewer opportunities to learn. Teachers who do not have a strong sense that they can influence student learning are therefore more likely to overreact to student error and failure (perhaps by subsequently assigning work that is too easy) than teachers who feel that they can influence student learning

and that they are a partial cause of student failure when it does take place.

Another explanation for differential teacher behavior is student behavior. Students present themselves in different ways to teachers and these self-presentation styles may influence teacher responses. Dee Spencer Hall (1981) has noted that some students are able to time their misbehavior in such a way as to escape teacher attention, whereas other students who misbehave just as often are reprimanded considerably more frequently because the timing of their misbehavior is inappropriate. Carrasco (1979) suggests that students may demonstrate competence in a style that escapes teacher attention. According to Green and Smith (1983), the language some students use makes it likely that teachers will underestimate their potential.

Metz (1978) provides another illustration of how students may influence teacher behavior. She reports that students in low track junior high classes like to do seatwork and dislike public interaction and classroom lecture. In part, low achievers prefer seatwork (and encourage teachers to assign more seatwork) because it presents less risk to them. We previously noted that teachers who do not possess management skills are especially likely to be vulnerable to student influence. Finally, McDermott (1976) found that in one classroom low achievers received less reading practice because they were interrupted frequently by other students during reading instruction. The interruptions were partly due to the fact that the low achievers' behavior during reading group allowed other students to interrupt them. Hence, students appear to be an active part of the expectancy cycle. The behavior of some students encourages and reinforces teaching efforts; whereas other students' behavior discourages teaching.

Green and Smith (1983) report that teachers use linguistic performances as one basis for evaluation of student performance. Thus, students must know academic information as well as how (and when) to display academic knowledge. Being accurate was not enough; students needed to present information in appropriate form at the appropriate time. Students have to know both the form and the content required. Thus, because of linguistic deficiencies and/or lack of awareness of social cues, some students may have much more difficulty convincing teachers that they know the material than do other students.

We have suggested several reasons why teachers may behave differently toward high- and low-achieving students: the complexity of the classroom, the ambiguous nature of student performance, teachers' beliefs about causality (their ability to cause or to influence student performance), and students' behavior. Obviously, these are dynamic influences and they often occur in combination. For example, Confrey and Good (in progress) note that in one class students were placed in either a high or low mathematics group on the basis of their teacher's interpretation of the students' performances during

the first weeks of mathematics class. The assignment of students to the high group was based in part upon the speed with which they were performing mathematics tasks.

Ironically, a week of observation indicated that students in the low group often watched what the teacher was doing in the high group and in interview sessions they indicated that they observed the highs because they wanted to get a step ahead and learn what the high group was learning. Unfortunately, because the teacher was interested in speed of performance and because lows spent time watching the other group rather than doing their own seatwork, their incomplete seatwork assignments reinforced the teacher's original expectations and supported the belief that the assignments to high and low groups were correct. Students' interpretations of their classroom roles and their behavior influenced and maintained teacher expectations and behaviors.

Student Passivity: Role Confusion

Recent research suggests that teachers vary widely in how they react to student problems and this variation may make it difficult for students to understand what is expected of them. As noted above, studies show that some teachers criticize low achievers more frequently than highs per incorrect response and praise lows less per correct answer than highs. In contrast, other teachers praise marginal or incorrect responses given by low achievers. These findings reflect two different types of teachers. Teachers who criticize lows for incorrect responses seem to be basically intolerant of these pupils. Teachers who reward marginal, even wrong answers, are excessively sympathetic and unnecessarily protective of lows. Both types of teacher behavior illustrate to students that effort and classroom performance are not related (Good & Brophy, 1977). Over time, such differences among teachers in the way they praise low achievers may reduce low students' efforts and contribute to a passive learning style.

Other teacher behaviors may also encourage student passivity. Low students who are called on frequently one year (the teacher believes that they need to be active if they are to learn) but are seldom called on the following year (the teacher doesn't want to embarrass them) may find it confusing to adjust to different role definitions. Ironically, these students, who have the least adaptive capacity, may be asked to make the most accommodation as they move from classroom to classroom. The greater variation in how different teachers interact with lows (in contrast to the more similar patterns of behavior that high students receive from different teachers) may be due to lack of agreement among teachers about how to respond to students who do not learn readily.

Even within a given year low achievers must often adjust to more varied expectations. This may be true in part because many lows have

several teachers (in addition to the regular teacher they may have a remedial math, reading, or speech teacher). Ironically, these students may receive less and/or different instruction because of attempts to provide them with extra assistance. Hill and Kimbrough (1981) studied pull-out instruction in schools that operated four or more categorial (special need) programs. They found that pull-out programs posed problems for students who received special assistance as well as for regular teachers because, due to scheduling problems, special programs were replacing, not supplementing, the core curriculum for many students.

Even when students did receive both regular and supplemental instruction, they were still not well served. Hill and Kimbrough found that in several cases incompatible teaching methods and materials were used in special and regular classrooms. Hence, many children became confused by conflicting approaches taken by special and regular teachers and conceptual learning was especially difficult for these students.

Grouping and Expectation Effects

Much of the recent research on teacher expectations examines teacher behavior toward individual students. However, there is growing evidence that students may also be affected by grouping, which often results in differential instruction. Confrey and Good (in progress) observed instruction in seventh-grade English and mathematics classes and interviewed some students in high and low groups in each class. They found that content presentation to low-achieving students was often characterized by fragmentation of material, repetition, little presentation of theory, and few integrating concepts. Students in low groups in classes grouped by ability spent much of their time on repetitive drill activities which were inadequately presented and discussed and not sufficiently related to relevant integrating concepts. Students were unlikely to receive the intended benefit from these activities even if they did them correctly.

Eder (1981) found that students in one first-grade class who were likely to have difficulty learning to read were assigned to groups whose social context was not conducive to learning. In part, this was because assignments to first-grade reading groups were based upon kindergarten teachers' recommendations and a major criterion of placement was the maturity of the students as well as their perceived ability. Eder observed reading group behavior throughout the year and found that the teacher discouraged interruptions of students' oral reading turns within the high group but not in the low group. According to Eder, the teacher may have been concerned with maintaining the interest of the low group during other students' reading turns (in general, their reading turns tended to be longer and filled with more pauses). The teacher may also have thought that lows had less intrinsic interest in the material; therefore, she was more

willing to encourage most forms of participation or responses from low students but demanded more appropriate behavior and responses from highs.

Because the most immature, inattentive students (as indicated by the kindergarten teachers) were assigned to low groups, it was almost certain that these groups would have more managerial problems (e.g., distractions) than others, especially early in the year. Indeed, because the teacher was often distracted from a student reader in the low group who was responding (because of the need to manage other students in the group, students often provided the correct word for the reader. Readers were not allowed time to ascertain words on their own, even though less than a third of the students interviewed reported that they liked to be helped and most thought this help interfered with their learning. Eder's work indicates that low students had less time than highs to correct their mistakes before other students and/or the teacher intervened.

Eder also found that students in the low groups spent 40% of their listening time not attending to the lesson (vs. 22% in the high groups). Low students frequently read out of turn, adding to the general confusion. Eder reports twice as many teacher "managerial acts" in the low groups as in the high groups (157 vs. 61), and found that turn interruption increased over the course of the year. Due to management problems, frequent interruptions, and less serious teaching, low students may inadvertently have been encouraged to respond to social and procedural aspects of the reading group rather than academic tasks.

It is difficult to conceptualize and describe what students learn in school, especially from the examination of practice in one classroom. However, it seems plausible that one of the effects of being in high and low reading groups in the classroom studied by Eder was that students learned <u>different norms for attention</u>. Students in the low reading groups were encouraged to be inattentive; whereas, students in the high group learned to attend to instruction.

Inappropriately low performance expectations are often associated with good teacher intentions, but such expectations still have harmful effects. As a case in point, Bob Germain (personal communication) has found instances of too much structure and direction. He found that textbooks were giving cues to poor readers about where they could find the answers to questions that appeared at the end of the chapter. Some low-achieving students simply read a particular page where they could find the answer rather than attempting to read all the materials. The cues embedded in the text materials were probably provided to help slow readers (in order not to overwhelm them). However, the practical effect was probably to encourage less reading and less thinking.

Teaching Dilemma

Clearly, teachers can expect too much or too little in their instructional interactions with students. This dilemma also has to be addressed by curriculum specialists who write textbooks and by policymakers. There are many instances in which teachers need to assign different types of material to high and low achievers. Teachers can make instructional mistakes by treating students too much alike, as well as too differently.

As I have pointed out elsewhere (Good, 1983), some teachers spend inadequate time with low achievers, but other teachers appear to find appropriate time for such students. Hence, rules such as "call on lows" more often will do as much harm as good (i.e., since some teachers are already doing these behaviors appropriately an increase in their behavior would have dysfunctional effects). The variables that affect teaching are numerous and complex. Knowledge related to teacher expectation effects is therefore best imparted to teachers along with judgmental and decision-making skills about appropriate policy (not the provision of a few simple behaviors to use or avoid). For examples of work that illustrate and encourage teachers' use of decision-making skills generally, see Amarel (1981), and in the area of teacher expectations specifically, see Good and Brophy (1978, in press).

Student Influence

Although there is conclusive evidence that teachers significantly affect student learning, student motivation and effort are also important aspects of classroom performance. Student behavior influences teachers' perceptions of students and in some cases affects the quality of instruction students receive. More directly, student perceptions of teacher behavior and student motivation are likely to influence how much effort students expend in the classroom (e.g., when classroom tasks are ambiguous and/or complex do students perceive them as a challenge and think and work or do they perceive such tasks as a threat and negotiate with teachers?).

There is increasing evidence that students' perceptions and self-perceptions are important sources of information about classroom learning. One wonders how students perceive standards and how their perceptions influence performance. Too little research has attempted to answer such questions and we need to more systematically study how students perceive and respond to academic demands. How students respond to these expectations should be an important research agenda in the 1980s.

Student Perceptions of Schooling

In a thorough review and integration of research on student perceptions of schooling, Weinstein (1983) examines studies of students' perceptions of teachers, other school personnel, peers, causes of behavior, the classroom, and the school.

Perceptions of teachers. Concerning perceptions of teacher behavior, classrooms vary in the extent of differential treatment perceived by students. There is evidence that students are highly sensitive to variations in teacher treatment (interaction patterns and nonverbal messages) within classrooms. Through varied treatment, students infer teacher expectations for academic performance. Moreover, differential relationships hold between teacher expectations, student expectations, and student achievement in classrooms where greater differential treatment is perceived than in other classrooms (e.g., Brattesani, Weinstein, Middlestadt & Marshall, 1981; Weinstein & Middlestadt, 1979; Weinstein, Marshall, Brattesani & Middlestadt, in press). That is, in classrooms where students were aware of teachers' differential treatment of high and low achievers, students' own expectations for themselves more closely matched the teachers' expectations, and the teachers' expectations for their students more clearly predicted student performance.

Studies of students' perceptions of teacher instructional behavior (e.g., Peterson & Swing, 1982; Winne & Marx, 1980, 1982) suggest that student perceptions and cognitions during instruction can mediate the effects of instruction on student achievement. Evidence indicates that students often may not perceive what teachers intend. Also, some students who appear to observers to be attending to lecture or class discussion reported in interviews later that they were actually thinking about other things, such as how they would perform in relation to other students.

In some classrooms, students may perceive more differential teacher behavior towards highs and lows than is indicated by behavioral records made by classroom observers (Cooper & Good, 1983). It is not clear whether students report greater differences in teacher behavior because they have more cues and are more sensitive to teaching acts than observers or because students "overreact" to certain cues. Some students are likely reliable observers of classroom events and others are probably not perceptive. Still, there is evidence that students can provide valuable insight about teaching (Cooper & Good, 1983; Weinstein, 1983). Just as teachers may act upon their beliefs and perceptions (e.g., they believe an average student is below average), students also react according to their perceptions of teachers' behaviors and intentions (Weinstein, in press).

Perceptions of ability. Developmental literature suggests that young children perceive ability or intelligence as a changeable

entity which can be improved with effort. They also seem to rely on absolute and individual standards rather than norms to assess ability. Blumenfeld and colleagues (1982) argue that young children's self-perceptions are thus biased in a positive direction.

However, there is much evidence that as students get older, classroom conditions (feedback patterns, reward structures) which increase the differences between high and low achievers affect students' perceptions of ability, and their perceptions of their ability more closely match their teachers' perceptions. Students also evaluate their own abilities by comparing themselves with peers during the daily performance of tasks in classrooms. The evaluative cues available to students, however, differ according to the structure (e.g., whole-class, group, or individual; lecture, seatwork) and climate (e.g., extrinsic vs. intrinsic reward structure) of the classroom and the school. A climate with high and flexible expectations, varied tasks and opportunities for evaluation, a focus on task mastery, and a belief in the changeability of intelligence can provide a context in which students can evaluate themselves on several dimensions and feel positive about their potential for future success.

Achievement behavior has been the most frequently studied process in relation to students' perceptions of the <u>causes of behavior</u>, particularly in an attribution framework. Applications of attribution theory to classrooms will have to consider how success and failure judgments are made by students. Recent work suggests that children's definitions of success vary across individual pupils, tasks, and situations (Frieze, Francis & Harrusa, 1982). One study (Frieze & Snyder, 1980) of the attributional patterns of elementary students for success and failure in four situations showed that the achievement situation elicited different causal mechanisms than other situations. Effort was most important for school testing situations, while ability was seen as critical to finishing an art project or winning in football.

Perceptions of Learning Activities

Students' perceptions of their learning activities vary widely. Recent literature suggests many young children and some older students are deficient in metacognitive skills, particularly in four areas: (a) predicting the difficulty of a task, (b) assessing the incomprehensibility or incompleteness of task directions, (c) planning ahead and using available time wisely, and (d) monitoring their progress and evaluating their own performance. Many students many therefore need some assistance in developing these skills.

Conclusion

Initially, most classroom research focused upon teacher beliefs and teacher behavior, and this same trend was evidenced in the area of teacher expectations. Indeed, the focus on teacher expectations has yielded a rich way of looking at and improving upon classroom behavior (Good & Brophy, 1978, in press). However, recent research has shown that students may interpret the same teacher behavior in different ways. Hence, those interested in teacher expectation effects have become more interested in student expectations and in how students influence teachers. As research becomes more complex and comprehensive and as research asks more sophisticated questions, it may become possible to increase our understanding of classroom communication. However, at present it is clear that extant research has already yielded important information and concepts that can be used to improve practice.

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CHAPTER 4

CRITICAL THINKING SKILLS

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"My claim is simple: anything that slights or interferes with the effectiveness of moment-to-moment teaching and learning will subvert the aim to improve education."

"When there are alternative perceptions about how to respond to instructional cues, it is likely that some students won't engage cognitive operations that teachers or authors of text intend."

"In general, teachers can help motivate students by insuring that students make appropriate attributions for successes and failures. Do not 'butter them up' by telling students they can do anything if only they'll try hard enough. Do tell them honestly why they succeeded or failed. And, whenever appropriate, focus students' attributions for their failures on sources that are under their control."

"While it seems so obvious as to approach the trivial that students need to know what the task really is, how many 10th grade students really comprehend tasks like these: prove a theorem in geometry; analyze a hypothesis in science; interpret the meaning in a poem; program a sorting procedure for your computer; or characterize a policy of a government? Students need to know what the task is and what they already know about it before tackling the task itself."

STEPS TOWARD PROMOTING COGNITIVE ACHIEVEMENTS

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The National Commission on Excellence in Education has issued nothing less than a stark challenge to America. In its report, A Nation at Risk: The Imperative for Educational Reform, the commission asserts unconditionally that if America does not remedy flaws and overcome difficulties in its educational system, then the country's leading place in the world may be forfeit. From my vantage point as an instructional psychologist, all the recommendations made in the report are welcome. But these proposals are, for the most part, global. They need to be analyzed further so they can be put into action. And, the report failed to consider one of the most obvious and most significant aspects of our educational system, namely, teaching. In this paper, I propose several remedies for this shortcoming. My focus is topics that bear directly on what happens when teachers try to teach and when students try to learn from teaching.

I hold that instruction is the fulcrum on which the lever of education rests. There is no doubt that changes need to be made to the educational system--changes such as improving the quality of textbooks, or increasing the time allocated to learning and homework, or selecting better teachers. What teachers and students do in classrooms, however, determines whether other changes to the educational system will have any effect at all. If instruction is flawed or inadequate, no other improvement to education will have fair chance to work. In taking this stance, I do not insinuate that non-instructional aspects of education can remain as they are. My claim is simple: anything that slights or interferes with the effectiveness of moment-to-moment teaching and learning will subvert the aim to improve education.

Let me introduce some central ideas about instruction in the form of an analogy that should have direct relevance to each of you. I presume you are here to learn about how to promote cognitive achievements, and that you expect me to teach you about steps to take in approaching this goal. There is little doubt that, as a group, you enter this lesson with different interests, varying amounts and types of knowledge about the topics I'll address, and all sorts of other differences that may affect how much and how well you learn from my talk. For instance, some of you undoubtedly should have gone to bed earlier than you did to be in top form for today's sessions. Others of you, in your zeal to arrive promptly at this first session, now may be distracted by your stomach's complaints about skipping breakfast or wolfing something of less than home-cooked quality.

The kinds of differences I've just described clearly influence how well this lesson will work. They are differences over which I have no control. That they affect your achievement only reinforces my point that there must be more teeth in responses to education's woes than merely a "quick fix" that I might attempt in the next hour of teaching. In my role as teacher, however, I can influence to some extent how you think. If it takes thinking on your part to learn, and I assert without proof that it does, then my teaching effectiveness varies in direct proportion to the extent that I can influence your thinking. The question that confronts me, as your teacher for the next hour, is how can I shape what you think about and how you think about it.

Let me foreshadow the rest of this presentation. To address questions of shaping what students think and how they think about it, I'm going to present three models. These models synthesize contemporary research on teaching and instructional psychology. Then, I'm going to use these models to suggest steps to take to promote cognitive achievements, as promised in my title. I'll wrap up my talk by offering a few suggestions about how these steps can be taken.

Models for Describing Instruction

I doubt anyone would claim that teaching and that learning from teaching are simple pursuits. To get a handle on complicated activities, however, it's often useful to consider simple versions of reality. Models are one form for such simplifications. Obviously, one model we should consider ought to describe what the teacher does while teaching. This model portrays instruction from the teacher's perspective. While teachers are teaching, students are doing something, too. Thus, we need a second model of what students do to learn from teaching. It should describe things from their point of view. These two models aren't sufficient however. We need yet a third model to describe how these first two fit together in the context of other features of instruction such as a curriculum and a social system that operates in the classroom. So, to describe instruction representatively, I will present three models, not merely one or two. This is as it should be--instruction is not simple. Too great an oversimplification of the complex reality of instruction is one of the reasons I believe we have not advanced as much as we would like in promoting cognitive achievements. I will speak more about simplifications versus oversimplications later. Now, I want to lay bare my assumptions about instruction. Then I'll describe the three models we'll need to address questions about what to teach it in promoting cognitive achievements.

Assumptions

Assumptions bridge the inevitable gap between an infinity of possibilities in theory and a limited set of particulars actually

dealt with in practice. They provide boundaries, setting off things that are considered from others that are ignored. I make three assumptions.

First, teachers and students are inherently cognitively active. Moreover, except for rare random perturbations in thought and genetically established reflexes, these cognitive activities are structured in patterns.

Second, I assume that learners pursue learning strategically and purposefully. This means that the cognitive activities that underlie learning are directed toward goals. This assumption doesn't contradict the fact that learners sometimes can't articulate what they have achieved or how they went about learning. What people learn sometimes can seem to themselves and often seems to observers to have been learned "unconsciously." Nonetheless, I assume that even in these cases, the cognitive activities that produced learning were strategic and purposeful.

Third, I assume that instruction is intentional. A teacher, or a surrogate for a teacher like a text or film, purposefully tries to determine what a student learns. This assumption doesn't deny the fact that students learn things unintended by the teacher. These learnings, however, do not result from instruction. Rather, they are the products of learners' inherent cognitive activity.

The first two assumptions characterize teachers and students as intelligent people who seek to achieve goals through action. The third assumption sets the stage for teaching to be <u>ineffective</u>. More specifically, whenever teachers' intentions go unfulfilled, instruction may not succeed. Arranging features of instruction to head off failure is a key to effective teaching. In order to make such arrangements, however, we need a directory of the features that comprise instruction. This directory is the model I will outline first. It provides a framework for fitting together the other two models I will present later to describe teaching and learning from teaching.

Facets of Instruction

The first model is based on research from the field of verbal learning. It describes instruction in terms of six facets: content, evaluation data, delivery of task cues, students' cognitive operations applied to acquire content and to retrieve content, and setting factors. First, I will describe each facet briefly. Then, I will demonstrate their interactive character.

<u>Content.</u> The information and motivations that teachers intend students to learn are content. There are three broad categories of content. The first category is knowledge. Knowledge can be subdivided further into two types. Declarative knowledge defines and

describes human experience. A definition of peninsula, an explanation for why a test was too hard, and an understanding of the periodic table of the elements are examples of declarative knowledge. The second type of knowledge is procedural knowledge. Procedural knowledge is a structure for action, for carrying out thinking or overt behavior. A heuristic for solving physics problems, a technique for coaxing a friend to help with homework, and a means for identifying essential information in a textbook chapter illustrate procedural knowledge.

The second category of content pertains to feelings and motivations. This type of content explains students choices among actions, and their vigor and persistence in pursuing those choices. Feelings of satisfaction and test anxiety illustrate this category of content. These are emotional reactions to past events and to events in the future.

The third category of content is called schemata. Schemata are complex, goal-oriented integrations of declarative and procedural knowledge and feelings. They are guides for taking action that delicately balance knowledge and motivation. Because their character is not found solely in the mere sum of their parts, schemata are accorded a separate category of content. As an example, when studying for an exam, a student's schema includes procedures for reviewing known material and its organization, and for checking how clear the material is. The schema also balances feelings about whether it is better to postpone telephoning a friend. As well, it includes hope for a good mark. It also contains criteria for deciding when fatigue makes further studying unprofitable, and more.

Evaluation data. This facet of instruction reflects the fact that students often receive feedback about their attempts to learn. Evaluation data always achieves meaning by a comparison either to an absolute standard or to a norm. The standard or the norm may be chosen by the student, as when a student sets a personal goal to achieve a mark of 85%. Or, the standard or norm may be imposed by the teacher. An example here is the case where teachers do or don't award partial credit. For students, the most obvious although not necessarily the most potent kinds of evaluation data are teachers' reactions in class and the scores received on tests and assignments.

Delivery of task cues. When students try to acquire or retrieve content they have a task to accomplish. In setting these tasks, teachers try to guide students' thinking by providing cues about how students might cognitively work on content. Two examples of cues teachers often use to shape students' cognitions are telling students to look for similarities between two concepts and starring particular bits of knowledge written on the chalkboard. Since cues like these are intended to help students acquire new knowledge, they can be labeled acquisition cues.

Correspondingly, there also are cues teachers deliver to shape students' cognitions directed to retrieving information. An example of a retrieval cue would be a teacher's admonition to "think hard" before answering a question. Presumably, this signals to students that they shouldn't necessarily be satisfied with a first or seemingly obvious answer. Instead, students should search their memories deeply before answering.

Acquisition cues and retrieval cues also appear in textbooks. Margin headings are intended to steer students toward acquiring a particular structure of content. Italics invite students to spend extra effort to acquire particular concepts. And questions inserted in text ask students to practice retrieving content in particular ways. Thus, the delivery facet concerns attempts by a teacher, text, or film to engage students in particular types of thinking about content to learn it and to retrieve it.

Acquisition operations. Students don't learn content by osmosis. Students acquire content by cognitively working with it and on it. To do this, they almost always activate related information that was learned previously. Sometimes, they may translate words into mental images or vice versa. Also, they may rehearse new content, create categories for bits of content, and monitor the products that result from these cognitive operations (Winne, 1984). These kinds of cognitive operations make up another facet of instruction, the facet concerned with thinking to learn content.

Retrieval operations. To find out what students have acquired, the teacher or the students themselves create occasions for students to retrieve content that was supposed to have been acquired. To do this mental work, students engage retrieval operations. These are the complement of acquisition operations. Retrieval operations are the means by which students bring content out of their cognitive storehouse to accomplish tasks like supporting the learning of new related information or answering test items. Mentally asking what is similar to a term in a question, or categorizing information and then searching for other content in this category are examples of retrieval operations.

Setting variables. Instruction always takes place in a social and cultural milieu. In classrooms, a large part of this milieu is structured by the teacher. This is done through rules for classroom management, a system governing rewards for students' scholastic and personal achievements, and routines for frequent activities like taking tests, boardwork, or science labs. Students, too, shape this milieu by choosing friends and models, by declaring their values, and even by their physical health. Thus, general but usually flexible conditions are established within which instruction takes place. These conditions are setting factors.

Summary. These six facets make up a directory for describing instruction. The directory can be titled by an acronymn that uses

the first letter of each facet: CEDARS. My brief descriptions of these facets barely hint at the true nature of instruction because I described each facet independently. Common sense and reams of research stress the fact that the facets interact. I can describe these interactions best by focusing microscopically on an example of one instructional act. At the same time, I'll develop the other two models needed to describe teaching and learning from teaching, respectively.

Models of Teaching and of Learning from Teaching

An example. Suppose Mr. Jones just asked his class, "How can we solve for X in a quadratic equation?" Jim replies, "By graphing." Mary chimes in, "By using the formula." Then Mr. Jones responds enthusiastically, "Right, Jim! And Mary, what's the formula?" Why did Mr. Jones do this?

Mr. Jones' praise of Jim's answer is both evaluation data and a cue he delivered to stimulate other students' cognitive processing. The evaluation datum marks Jim's answer as correct. But this mark also must involve other students in thinking about content if they are to learn that graphing is one method for solving quadratic equations. How should students think upon delivery of this acquisition cue?

Similarly, Mr. Jones' prompt for Mary to provide the formula also spans the delivery and evaluation facets. As an evaluation datum, Mr. Jones intends that his prompting question signals to Mary, and to the other students, that Mary's answer is not up to a standard. Mary didn't give a complete answer--she left out the formula. As well, the teacher's prompt is a cue for students to respond cognitively to this instructional interchange made up of a question, Mary's answer, and the prompting question. Can you guess the cognitions Mr. Jones is cuing? Can the students? I will describe two models that frame answers to these kinds of questions. But first, let's return to the CEDARS model momentarily.

Who determines what? In terms of the CEDARS model, the teacher and students exercise varying degrees of control over each of the facets. The content facet and the delivery facet are mostly controlled by the teacher. For example, if the teacher chooses not to present graphing as a method for solving quadratics, this content won't be part of instruction unless a knowledgeable student like Jim divulges it in class. Similarly, in most classrooms, the teacher determines most of the cues delivered during teaching that are signals to students about thinking. However, students also deliver cues that can guide cognition. Remarks like, "That formula seems really important to remember" can function as acquisition cues. As well, teachers are almost solely in control of externally provided evaluation data that refer to declarative and procedural knowledge. On the other hand, students control most of what works as evaluation

data for motivations. Teachers and students share control of evaluation data for schema.

Features of the setting facet are very much jointly determined by the teacher and the students. Although the pace of teaching starts out to be teacher determined, students almost always influence pace by looking puzzled, asking questions, or nodding in agreement as the teacher talks. While the teacher can define rules for handing out grades, students may treat these rules as a competitive system or an individual one. As a last example, the climate of a class--its openness, supportiveness, and so on--is clearly influenced by all the participants.

The remaining two facets, the complementary cognitive operations that students engage to acquire content and to retrieve content, are mostly under each student's control. A student decides whether to pay attention or to rehearse a formula. How students think when acquiring and retrieving content is central in determining what they learn. In other words, students cognitively mediate the impact that teaching has on what they learn. By planfully manipulating cues in the delivery facet, and influencing features in the content, evaluation, and setting facets, Mr. Jones tries to shape students' cognitive mediations of instruction. In general, to be successful, a teacher must intentionally influence students' cognitive activities in lessons. But the teacher cannot control these cognitive activities directly--students cognitively mediate the effects of Mr. Jones' teaching. Let's return to Mr. Jones' algebra class to develop a model of students' cognitive mediations of teaching.

<u>A cognitive mediational model of teaching</u>. The degree of correspondence between each student's cognitive mediations of Mr. Jones' cues and his intentions for students' cognitive activities determines how effective instruction will be. At least four separate conditions must be met if this correspondence is to be achieved.

First, in order for Mr. Jones' cues to function at all, students must attend to them. Those who don't listen to Mr. Jones praise Jim and prompt Mary obviously can't be influenced to shape their cognitive operations as he intends.

Second, students must correctly perceive Mr. Jones' intentions behind his cues. If, for example, students don't understand that Mr. Jones wants them to rehearse Jim's answer when he praises it, this cue won't function to help students acquire the content that quadratics can be solved by graphing. Or, if students don't perceive that Mr. Jones wants them to add to their schema a routine that elaborates answers when a formula is involved, then his prompting of Mary's answer won't teach what he means by complete retrieval of content. Thus, students need to perceive cues correctly for teaching to work.

Third, students who attend to and perceive Mr. Jones' two cues must be capable of carrying out the cognitive operations to yield the two cognitive products Mr. Jones seeks for them to create. If students can't remember all the terms in the equation when Mary answers, they won't be able to rehearse the content or feel pleased about acquiring it when Mr. Jones praises Mary.

Finally, even if students attend to, perceive, and are capable of carrying out the cognitions Mr. Jones intends by delivering these particular cues, some simply may choose not to do it. These students lack motivation to mediate instruction as the teacher intends. Instruction won't be successful for these students.

A central feature of everyday teaching highlighted by the cognitive mediational model is that students have cognitive tasks to accomplish as they try to learn from teaching. This suggests a third lens for viewing lessons. I turn next to a model of learning from teaching that provides this perspective.

Student tasks in learning from teaching. Students in classrooms have jobs to do. From their vantage point, they are responsible for decoding instructional cues and cognitively manipulating content to achieve mastery of the curriculum. As described earlier, content encompasses more than merely the declarative and procedural knowledge in a subject area. Students also are expected to develop self-reliance, to coordinate their wants with the rules of school's society, to build interest, and much more. Moreover, students are supposed to acquire schema to guide complicated thinking and behavior involved in problem solving, designing and completing projects, and so on. All these acquisitions are cognitive achievements that result when students engage in and successfully complete tasks.

A task is something that the student must do. Answering a teacher's question, planning a session to study for an exam, and sustaining self-concept are tasks. Tasks are bounded by a set of initial conditions and a goal. Tasks are worked through step by step according to cognitive plans. Some aspects of tasks are determined by variables in the facets of instruction over which the student has minimal control. For example, Mr. Jones determines whether students will work out equations with or without opportunities to look back at the book. This variable comes from the setting facet. Also, Mr. Jones determines how the task is introduced. For instance, he might intend to prime students' memories either by a demonstration or by providing only a verbal explanation of what to do. As well, Mr. Jones defines some of the standards by which students' work on the task will be judged, a variable from the evaluation facet. Here, for example, he may or may not award credit for partially correct answers.

Other features of the initial conditions, the goal, and the dynamics of accomplishing tasks are mostly determined by students. For instance, students may be motivated to persist at solving equa-

tions even when they encounter difficulty. This variable describes a motivational aspect of their acquisition and retrieval operations. Turning to the evaluation facet, some students may feel good that they are persistent because this proves to them that they're trying hard. Other students, however, may evaluate their felt need to persist as an indicator of their ability. For them, taking a long time only proves they aren't smart.

A distinguishing feature of tasks is that students use plans to carry out tasks. Plans are organized arrangements of schemata that students use to accomplish tasks. Plans typically follow a general sequence like this: (1) Compare the current status of cognitive accomplishment with the goal. Quit if these match within some tolerance of the standard or norm that applies to this task. If the current status is below the tolerance allowed, try to characterize the differences to learn something about what needs to be done next. (2) Activate knowledge, motivations, and schema that, according to the plan being followed, have some potential to reach the goal. Use these to operate on the cognitive products that make up the current status. Also, find new content from either memory or the external environment (a friend, stuff on the chalkboard) that can help. (3) Recycle to the first step.

This cycle for carrying out plans to accomplish tasks is called a test-operate-test-exit unit or TOTE. Two tacit aspects of cognitive activities like TOTE's merit explicit mention. First, the goal for any single task is multidimensional. Alternatively, it could be said that there are many goals for any given task. Students approach tasks not merely to satisfy teachers' intentions about instructional objectives. Inherent in tasks are students' feelings about themselves and the topics they are learning about, as well as opportunities to practice and adapt schemata. Although a task like learning from a demonstration sometimes may seem to focus only on one particular item of content, say a procedure for graphing quadratic equations, it inevitably involves all three categories of content.

The second tacit feature of tasks is that they are jointly produced by a teacher and a student. Tasks are mediated cognitively by students. Students translate tasks teachers pose into personal cognitive representations via cognitive mediations of instruction. The initial conditions and the goal that bound a plan for accomplishing school tasks depend on students' attention, perception, capabilities, and motivation. Thus, tasks that students pursue in school are inherently "their own" in every respect.

Consolidating the Models

These three models--the CEDARS model, the cognitive mediational model of how teaching can impact learning, and the task model of how students learn from teaching--describe instruction from three different but interrelated vantage points. These brief sketches also

capture two major aspects of contemporary research in instructional psychology. The first is that instruction is riddled with interactions. Although I omitted descriptions of hosts of such interactions researched in instructional psychology, the message is clear: a representation of instruction that is ecologically valid will not be simplistic. Because these three models blend together in ways that point to interactions, they begin to lessen the distance between abstract research and accounts of idiosyncratic, real, every-day instructional events.

The second feature of my multi-model approach is that it blends together empirical research and theory from many traditions. For instance, instructional objectives are linked to motivation by way of students' cognitive renderings of goals for the tasks they pursue during lessons. Also, structural designs for content are linked to teaching skills via the conditioning factors of students' attention, perception, capability, and motivation in the cognitive mediational model.

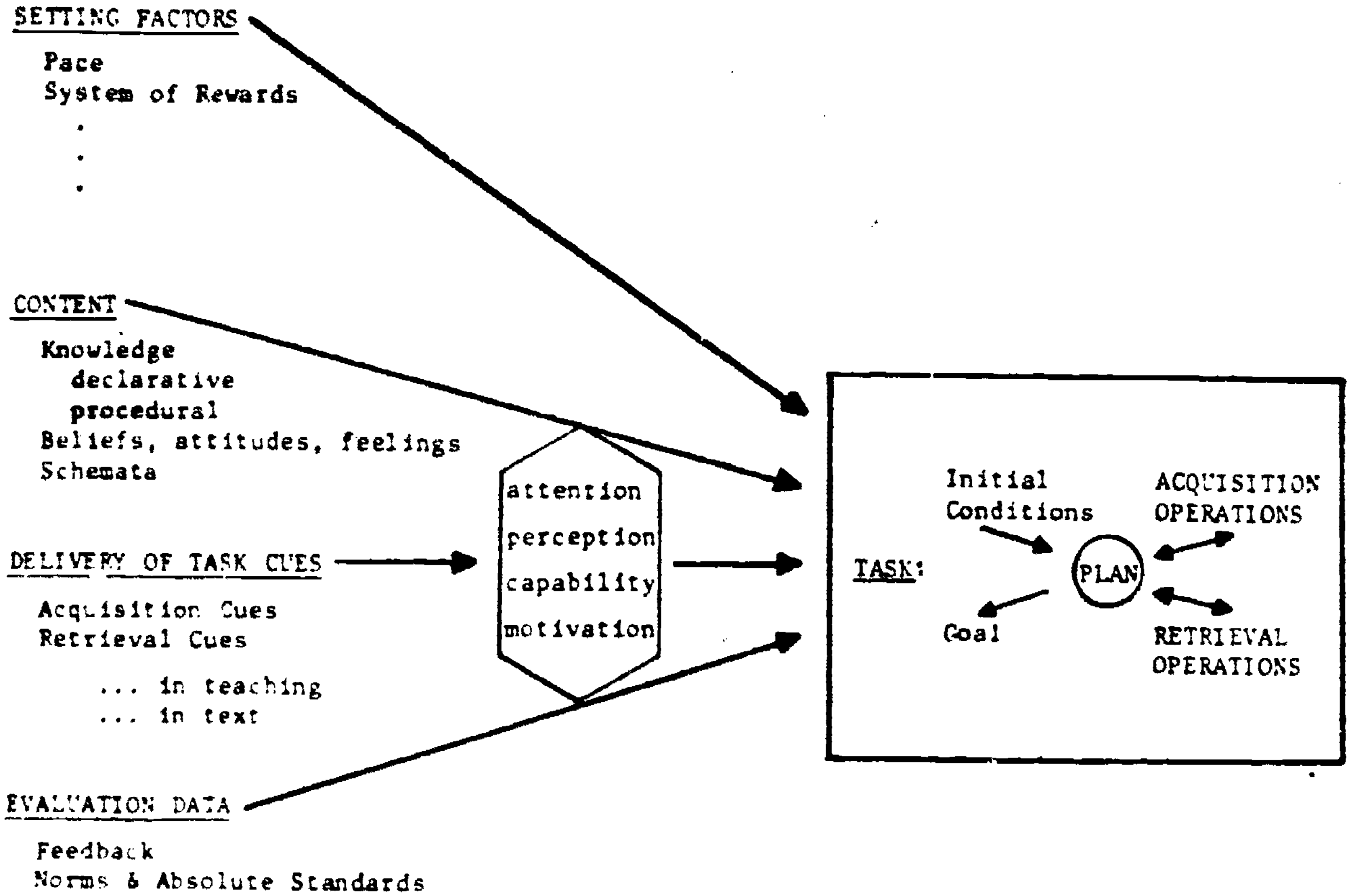
Summary and Forecast

To this point, I have presented a set of three assumptions that set off my view of instruction from hosts of others and three models that describe instruction per se. The assumptions are: (1) cognitive activity is inherent and patterned; (2) learning is a goal-oriented cognitive activity; and (3) instruction is an intentional activity where teachers intend to influence students' learning.

I have attempted to diagram the three models and the ways they relate to one another in the accompanying figure. One model, the cognitive mediational model, elaborates the dynamics of my third assumption regarding the intentional aspect of instruction. It identifies four separate ways that teachers' attempts to guide students' cognition can be foiled. Specifically, if teachers are to realize their intentions, students must succeed at: (1) attending to cues about cognition; (2) correctly perceiving the nature of cognitive work that the teacher intends to be engaged; (3) having available the resources needed to carry out cognition capably; and (4) being motivated to accomplish these cognitive activities.

A second model, the task model of how students pursue learning from teaching, sketches the dynamics of instruction from the students' point of view. This model describes three interlocking features of learning as a task: (1) the information available when the task is presented initially; (2) the goal toward which students are to work; and (3) cognitive plans that assemble resources and coordinate students' cognitive attempts to reach the goal from their initial condition.

The third model, CEDARS, identifies facets of instruction within which the preceding two action-oriented models are lodged. CEDARS


SETTING FACTORS
Pace
System of Rewards
.
.
.
CONTENT
Knowledge
declarative
procedural
Beliefs, attitudes, feelings
Schemata
DELIVERY OF TASK CUES
Acquisition Cues
Retrieval Cues
... in teaching
... in text
EVALUATION DATA
Feedback
Norms & Absolute Standards
attention
perception
capability
motivation
TASK:
Initial Conditions
Goal
PLAN
ACQUISITION OPERATIONS
RETRIEVAL OPERATIONS

is an acronymn for content, evaluation data, delivery of cues, acquisition operations, retrieval operations, and setting factors. This model functions like a checklist. When planning for teaching and when analyzing teaching effects, information about each facet is needed to put together a complete picture of what happened. Moreover, as shown in my example of Mr. Jones' teaching, interactions across facets are the sparks that animate the CEDARS model. Interactions are the proper focus, not just each separate facet.

So much for assumptions and models. How can we use these to promote cognitive achievements? The forecast of an answer is seductively simple. Like everything else so far, it has three parts. First, make sure that teachers' intentions for students' cognition are realized. Do this by insuring that students succeed at attending to delivery cues, at correctly perceiving the cognitions teachers intend them to activate, at having necessary resources so they have the capability to succeed, and at being motivated. Second, support students as they pursue tasks. Do this by insuring that the task can be accomplished given its initial conditions, that the goal of the task is perfectly clear, and that students have a cognitive plan that will work. Third, coordinate these two activities across all the facets of instruction. Do this by insuring that what happens in one facet does not interfere with the events occurring in any other facet. Better yet, make the interactions among facets synergistic, dynamically supportive of one another.

Let's explore in more detail how this answer might take shape in reality.

Promoting Cognitive Achievements

In this second section of the talk, I'm going to describe some ways of teaching that can promote cognitive achievements. But before I go on, I'm obligated to point out clearly that what I'm about to describe is as much an agenda for future research as it is a synthesis of select contemporary scientific knowledge about instruction. I admit up front that answers aren't yet available to our most central questions about how to enhance teaching and learning. But we all know that. What I do claim, without hesitation, is that we now have means to approach truly significant improvements in schooling. Like any other change in human affairs, this will take time. Inevitably, it will show some zig-zagging around an ideal path to improvement. I'll have more to say on this at the end of my talk. Now, however, with these caveats in mind, let's set aside these issues and return to the domain of instructional psychology.

Steps Toward Realizing Instructional Intentions

According to the cognitive mediational model, four cognitive factors determine whether students will respond cognitively to their

teacher's delivery of acquisition cues and retrieval cues. These factors are students' attention, perception, capability, and motivation. What sorts of steps can be taken to increase the chances that students succeed at each of these cognitive achievements? A general answer to this question is fairly straightforward: teach students about the cognitive work that corresponds to instructional cues. I'll treat each of the four factors in turn.

Gaining Attention

Cues that teachers and texts deliver to students may not always be noticed. Occasionally, cues that students know about are actively ignored. For example, how many students pay attention to the various levels of headings when reading textbooks? Headings are acquisition cues. During classroom teaching, do students pay attention to teachers' cues that provide similar information about how content is organized? For instance, are overviews that teachers sometimes give at the beginning of lessons attended to, or are students otherwise busy getting out a book or finding last night's homework?

Three key things probably determine whether students attend to cues. First, they may need to be told that particular teaching behaviors and features of text <u>are</u> cues to use particular cognitive operations. Second, students <u>need</u> to be undistracted by other events in order to pay attention to an instructional cue. If other pursuits, like having the answers ready from last night's homework on quadratic equations, are more important for avoiding criticism than is listening to an overview that the teacher is presenting right now, then we shouldn't expect students will pay attention to some cues. Third, teachers need to teach in ways that help to make cues salient. Slowing down, pausing slightly before and after cuing, modulating pitch and loudness of the voice or color of the chalk may help.

Clarifying Perceptions

There is much evidence that students don't always accurately perceive what form of cognitive work to do after they've attended to an instructional cue. Consider one of the cues prominently written about--teacher praise. After a student has answered a question or performed a task, a teacher might react, "Well done, Mary." What cognitive work is Mary supposed to do now: attribute her success to effort, rehearse the content she just spoke, conclude that this topic can be rewarding? Moreover, what cognitive operations does the teacher intend the other students to engage when they supposedly listen to this interchange?

As another example, how should students react cognitively to the very common cue delivered in textbooks of questions inserted within or between paragraphs? One possibility is to try to retrieve an answer. Another is simply to do a superficial mental check to see

whether concepts mentioned in the question make sense or are still available in memory. Yet a third possibility is to forget trying to answer the question and go back in the text to find one.

When there are alternative perceptions about how to respond to instructional cues, it is likely that some students won't engage cognitive operations that teachers or authors of text intend. Also, students sometimes are so active in seeking cues about how to learn from teaching that they attend to and perceive an instructional cue that their teacher did not provide intentionally. In other words, some students' perceptions of instructional cues are "immaculately conceived"--students judge they have been cued to do certain kinds of mental work when the teacher intended no such thing.

Lots of research has shown that students can be trained to perceive teachers' and authors' messages about which cognitive operations to use in response to different instructional cues. Providing training like this seems to be the obvious answer to students' problems of unclear perceptions about instructional cues. Such training should focus on the procedural knowledge and schemata that make up plans students use to accomplish classroom tasks. I'll have more to say about this later when I describe steps to take to facilitate tasks.

Maximizing Capability

Let's assume that a student has attended to an instructional cue and correctly perceives the nature of cognitive activity, that is, the plan that's appropriate for the task at hand. Knowing how to operate cognitively on content doesn't guarantee that the student will be capable of succeeding. The teacher must take steps to insure that students are capable of performing the operations necessary to succeed at instructional tasks.

In general, there are two conditions to which teachers should attend to maximize students' capabilities to succeed at cognitively mediating instructional cues. The first condition is that students, like everyone else, are limited in the amount of information that they can handle. Care must be taken not to overload the limited capacity of the cognitive processing system. One way to avoid overloading the system is to design instruction so that the students are not doing more than one or two tasks at a time. For instance, the teacher who asks a tough question and then turns to write some new content on the chalkboard during the ensuing silence invites students to overload their memorial capacities.

Another technique that can help to reduce the strain on students' cognitive systems is to chunk together similar bits of content. If our Mr. Jones is working out a quadratic inequality on the chalkboard, that is, demonstrating procedural knowledge, he may be asking students to work on too many chunks of content if he also

asks students for definitions of terms associated with quadratics such as discriminant and leading coefficient that are declarative knowledge.

The second condition that bears on students' capabilities to mediate instruction is the degree to which students have practiced the task. Instructional psychologists have demonstrated many times that students have a greater chance to succeed at learning when they can execute cognitive operations automatically. The way to enhance automaticity is to drill. Drill doesn't have to yield rote, non-meaningful learning. Non-meaningfulness is a property of what students learn, not how they acquire and retrieve it. So, in the case of students' cognitive mediations of instructional cues, teachers need to do more than tell students to perceive cues accurately. Teachers also need to provide students with extensive practice to make links between cues and associated cognitive operations automatic.

Motivating Cognitive Work

When teachers ask students to mediate cues, students have to do cognitive work. Just because students know when to do what and are capable doesn't guarantee that they'll "bother" to follow the guidance teachers offer by instructional cues. Students need to be motivated. I can outline several techniques for motivating students in the abstract. Obviously, teachers will need to personalize these suggestions.

First, if students don't know what outcome to expect when they engage in cognitively mediating instructional cues, it's not likely that they'll be motivated. Unpredictability can mean risk, and risks are often dealt with most comfortably by avoiding situations like asking questions or offering opinions. Communicating to students what outcome expectations apply in cognitively mediating instructional cues is one component in motivating students.

Knowing the likely outcomes of different instructional tasks isn't enough to motivate students, though. Students also need to believe that they are likely to succeed at accomplishing acquisition and retrieval tasks to which instructional cues refer. If students have low expectations about their efficacy, they probably won't be motivated to engage in the cognitive work teachers outline. What can teachers do to increase students' efficacy expectations? Probably the most beneficial thing is to insure that students are solidly skilled in plans for accomplishing tasks. Expectations for completing a new task almost always are high when the new task is like one that's been completed successfully many times before. Introducing a new task by pointing out similarities between it and prior tasks, and making sure that students have been successful on the previous tasks is a good method for raising efficacy expectations.

There is yet one more important dimension to motivating students. Suppose that a student knows the outcomes to expect for succeeding and for failing at a task. Suppose further that this student has a very positive expectation about being able to do what the teacher asks. Will the student be highly motivated? Not necessarily. Students, like others, attribute their successes and failures to different sources. For instance, success at a task might be attributed to luck or extra effort or an especially easy task. Failure might be attributed to being stupid, not working hard or long enough, or an especially hard task. Some attributions, like failing because of low ability, are not motivating. Attributions like succeeding because the task was so easy that anyone at all could do it aren't motivating either. In general, teachers can help motivate students by insuring that students make appropriate attributions for successes and failures. Do not "butter them up" by telling students they can do anything if only they'll try hard enough. Do tell them honestly why they succeeded or failed. And, whenever appropriate, focus students' attributions for their failures on sources that are under their control.

<u>Summary</u>

This finishes my set of suggestions that derive from the cognitive mediational model. Here, then, are steps, point by point, that teachers can take to improve students' cognitive mediations of instructional cues.

STEP 1 Tell students what instructional cues are used.

STEP 2 Structure presentations so that only one cue is delivered at a time.

STEP 3 Make instructional cues stand out.

STEP 4 Train students to know which procedural knowledge and schemata to match with acquisition cues and retrieval cues.

STEP 5 Avoid overloading cognitive capacity: present one task at a time and chunk similar content.

STEP 6 Drill students so that cognitive mediations of instructional cues become automatic.

STEP 7 Tell students explicitly what outcomes to expect when cognitively mediating instructional cues.

STEP 8 Maximize students' efficacy expectations by telling them how new tasks are like previous ones at which they have succeeded.

STEP 9 Make explicit the sources to which students should attribute their successes and failures at tasks.

Steps Toward Facilitating Instructional Tasks

Earlier, I described a model of how students approach learning from instruction. It characterized learning as a task. To carry out learning tasks, students activate cognitive plans to work on a set of initial conditions, transforming and adding to these conditions to achieve multiple goals. When our Mr. Jones asked, "How can we solve for X in a quadratic equation?", he set a fairly uncomplicated task. The initial conditions here are the topic, namely, methods for solving a particular form of equation and a request for students to respond. Superficially, the goal appeared to be to name members in a category of such methods. But as we saw, Mr. Jones applied criteria for achieving the goal that went beyond merely naming methods of solution. He also prompted Mary to present the quadratic formula in addition to naming this technique.

To accomplish tasks like this--or others like preparing a report about a chemistry lab, studying for a test, taking good notes, and having a productive discussion--students need content knowledge. In particular, they need to comprehend both the initial conditions and the goals that bound the task. Then they require schemata that can be activated as plans for carrying out tasks. I'll address each of these three features of tasks in turn.

Comprehending Initial Conditions

There are two types of content that students need to master before they can comprehend the initial conditions of a learning task. I already have spoken extensively about one of these, namely, the guidance that teachers intend to provide for students by delivering instructional cues. If students can't use instructional cues, then an important part of the initial conditions of school tasks will be missed. My message here is simple: to promote cognitive achievement, take the nine steps just described.

The other type of content students have to understand to comprehend the initial conditions of a task is declarative knowledge about what the task is. If I ask you to instrumentally condition students to shadow text, do you have any idea what task I've set? I doubt it. While it seems so obvious as to approach the trivial that students need to know what the task really is, how many 10th grade students really comprehend tasks like these: prove a theorem in geometry; analyze a hypothesis in science; interpret the meaning in a poem; program a sorting procedure for your computer; or characterize a policy of a government? Students need to know what the task is and

what they already know about it before tackling the task itself. This is what I mean by comprehending a task's initial conditions.

Comprehending the Goal

All tasks have goals. As I described earlier, tasks almost always have multiple goals that relate to the three categories of knowledge, motivation, and schemata. Students need to comprehend what goals are set for tasks during instruction. There are at least two significant reasons for this. The first is that a student's understanding of goals is a major determinant of the cognitive plan that is activated to pursue a task and of the criteria used to monitor how the plan progresses. I'm sure you're all familiar with students' constant desire to know when they'll be tested on material they read. The reason for this incessant clamoring is not only to avoid low marks. Students use different cognitive plans when they read text for a quiz tomorrow than when they expect only to have to be conversant with the content. In particular, they rehearse more frequently and they rehearse different content in reading for a quiz. Thus, the way students comprehend the goal affects how they cognitively work on content.

The second reason students need to comprehend the goals of a task is motivational. If students are not clear about goals, motivation likely will be low. This is because it is not clear what outcome to expect for effort that has to be devoted toward accomplishing the task. A good illustration of this phenomenon can be seen when students ask, "Why do we have to learn about quadratic equations?" The same notion applies to the clarity of goals in history, grammar, meteorology, and programming logic. Without clear expectations about the goals of these tasks, it's not clear why they should be worked on.

The remedy for poor comprehension of goals for a task is much like that for initial conditions. Students need to know what the goals are for each task they undertake. Moreover, they want to know what consequences to expect for their efforts. Both these kinds of knowledge are declarative. Hence, students should be told what the goals of tasks are before inviting them to work on tasks per se.

Having Plans

Given that a student comprehends the initial conditions and the goals of a task, what remains is to engage cognitive plans to transform the initial conditions into the goal. Cognitive plans are sometimes simple, but most often, they are complex. As is true of all the other kinds of knowledge, the schema that underlie cognitive plans can be taught directly. Teaching students plans for accomplishing instructional tasks has become a prominent area of research

in the last half-dozen years. What has been learned from this research can be summarized very tersely as follows.

First, plans involve several steps. Each step needs to be taught to the point that it is easy to carry out. In other words, each step of the plan should become automatic. This degree of mastery is necessary so that students can devote their cognitive resources to operating on content according to steps in the plan rather than figuring out how to work out steps in the first place.

Second, students need to see how the steps in the plan or how the plan as a whole can be used to approach goals of tasks. If part of a plan calls for students to identify significant features of some concept, they might be shown how this same step also will help them when they write essay answers. Identifying significant features of a concept during acquisition in class isolates these for rehearsal. Identifying significant features of a concept during retrieval in an essay test item elaborates answers in ways likely to earn more points. Coordinating acquisition operations and retrieval operations like this is valuable.

Third, students can't learn plans or become proficient in using them without practice and feedback that focuses on the plan rather than a curriculum area. For instance, suppose one step in a plan for reading science text for comprehension is using prior knowledge to interpret new content. Here, a student might mentally pause after reading each paragraph to compose an analogy between the content in the paragraph and prior knowledge. If the paragraph described how the shape of coastlines influences tidal volume, an analogy might be drawn to the topography of land masses and wind currents. Students need practice in composing analogies like this and feedback to help them determine how good their analogies are.

To provide feedback, teachers need hard copies or traces of these mental analogies, perhaps obtained by having students record several analogies per reading assignment. In general, traces should provide clear evidence about which cognitive activities were practiced by students and whether they were practiced at all. Traces also are essential as a basis for providing evaluation data about the quality of the student's cognitive achievements. Thus, traces of students' cognitions for teachers go hand in hand with practice and feedback about plans for students.

Summary

Tasks are the means by which students attain cognitive achievements. To increase students' proficiency at carrying out instructional tasks, teachers need to take steps to help students comprehend the initial conditions and the goals that set boundaries around tasks. As well, teachers need to prepare students to engage in tasks

by teaching cognitive plans. Here, point by point, are steps teachers can take to facilitate students' accomplishment of instructional tasks.

STEP 10 Teach declarative knowledge used to set a task before assigning the task.

STEP 11 Teach declarative knowledge about the goals of a task.

STEP 12 Teach students the plans they need to accomplish tasks.

STEP 13 Make students capable of carrying out each step in a plan automatically.

STEP 14 Teach the general utility of each step of a plan and of the plan as a whole.

STEP 15 Obtain traces of the products of steps in a plan to insure that students practice steps and to provide a medium for evaluation data.

Recapitulation About Cognitive Achievements

In the preceding moments, I've sketched a series of 15 steps that teachers can take to promote forms of students' cognition. Each step has been targeted at affecting what happens during instruction, when teachers are teaching and when students are trying to learn. Cognitive achievements of the kinds I've been describing that are attained during lessons are what make teaching effective or ineffective. If students can reach these cognitive achievements, during instruction, then I believe we will have made substantial strides toward improving the overall quality of education. But I have yet a few more steps to add to this list before I finish this talk. These last few steps address means by which teachers may be helped to take the preceding 15 steps.

Steps Toward Taking Steps: A Beginning for Change

At several points in this presentation, I've made note that there are difficulties that will impede taking the steps I advocate or that make the steps themselves tentative rather than sure-footed. Before closing, I want to patch up a portion of these issues as I promised I would in my introduction.

I do not delude myself with false hopes that you can return to your schools to put in place the steps I've outlined today. At the beginning of this talk, I asserted that instruction is not simple.

I'm sure you'll agree that the theoretical content I sketched in the first half of the talk is not simple either. But it is essential to sketch these models to provide structure and reason for the steps I outlined to promote cognitive achievements. In reality, the three models I described are schemata that teachers can acquire and use as plans to guide their instruction. It is my firm belief, a belief based on teaching these schemata to undergraduates in a course and on the research about pre- and inservice teacher education efforts, that piecemeal workshops will not suffice to teach these schemata to teachers. A long-term concerted effort is what's needed. Hence, the place to begin implementing what I advocated today is in teacher education programs. Teachers, just like students, need to reach levels of application that are automatic. This requires lots of drill, supplemented by extensive evaluation. Just as much care will be needed to design instruction for teachers as is needed for public school students.

In the opening to the second half of this talk I specified that my suggestions pointed to needed research in the future just as much as they synthesized what is already known. There is an important message in the fact that I can't provide unequivocal answers to resolve the dilemmas faced in today's educational system. The message is not that research is fairly useless, something to be called on to make impressive rhetoric and shunned in practice. Experience and good will, by themselves, aren't adequate either. If they were, the millions of hours logged by practicing teachers already should have provided almost all the solutions for which we are searching today. Rather, we need to encourage good research. Teachers, students, and professional researchers need to work together to create the knowledge we need. And school systems need to be not merely receptive, but active initiators of research.

In summary, then, here are two more steps that need to be taken in order to promote public school students' cognitive achievements.

STEP 16 Revamp teacher education curricula to include features corresponding to Steps 1-15.

STEP 17 Do research, either on your own or in collaboration with professional researchers.

"Teaching procedures must provide enough support for teachers to use them as they are, yet enough flexibility to allow for teachers to tailor their instruction to their classes. Involving classroom teachers who are in the operating system in the development of the instructional system may help assure program appropriateness and acceptance."

"The task of designing an integrated instructional and assessment system for critical thinking poses a formidable challenge. School systems must decide whether they want to teach critical thinking as generalized or curriculum-embedded skills. Schools must also specify the set of component skills the critical thinking program will teach and test and the range of content and activities in which students will use critical thinking skills."

DESIGNING AN INTEGRATED INSTRUCTIONAL AND ASSESSMENT SYSTEM FOR CRITICAL THINKING SKILLS

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The desire to teach students to form reasoned interpretations and evaluations of their academic and personal experiences pervades educational rhetoric. The philosopher, Mortimer Adler, has called for renewed emphasis on critical thinking; the New York Times devoted an educational supplement to new critical thinking efforts, and even the Reader's Digest recently featured an article on how to think better!

Clearly, the public expects schools to teach students to think, not simply to absorb subject-matter content. Although courses of study for most school subjects contain goals for teaching inference and criticism, and periodically there are special projects that attempt to develop critical thinking skills, for the most part, these efforts have had little success in producing classroom activities teachers will use systematically. Not too surprisingly, evidence is mounting that students' interpretative and evaluative skills are not well developed. The results of students' reading, thinking and writing skills by the National Assessment of Educational Progress (NAEP) indicated that few students at any age level could write essays in which they formed and explained interpretations of reading passages (NAEP, 1981).

The problems plaguing attempts to establish critical thinking classroom instruction are varied and formidable. There is little consensus on what critical thinking is, on how to teach it or on how to measure its outcomes. Furthermore, despite the lip service paid to the need for instruction on higher-order reasoning skills, teachers and students may view critical thinking curricula as tangential to required courses of study, as appropriate only for high ability students, or as too demanding of time and effort. To compound the problem, administrative and economic support for projects has often been too weak or short-lived to permit sustained critical thinking instruction to become an established classroom routine.

The purpose of this paper is to examine some of the problems involved in designing an integrated system to teach and assess critical thinking skills in the classroom and to describe attempts to draw upon research from diverse disciplines to inform the development of an effective, viable pilot project in the Pittsburgh public school system.

Background of the Monitor Achievement in Pittsburgh (MAP) Critical Thinking Project

Before reviewing research and theory that influenced the initial design of the MAP Critical Thinking Project, it is important to know the events and perspectives that instigated it. The design of the Critical Thinking Project in the Pittsburgh Public Schools was forged by two major forces: the commitment of the superintendent, Richard C. Wallace, to use a mastery learning approach to improve student achievement, and our conviction that a program in which students wrote about what they read could provide a powerful framework for developing disciplined critical skills, as well as reading and writing skills. The charge to superintendent from the school board was to lead the development of a plan to improve achievement; a component of his strategy was to draw upon Bloom's mastery learning model to focus, structure and coordinate instruction, assessment, and staff development efforts (Bloom, 1968). Part of the assessment component was to be a districtwide diagnostic assessment system administered every six weeks, to Monitor Achievement in Pittsburgh (MAP). Our project joined other MAP projects in math, writing, and reading to extend development of critical thinking skills.

In the project, we have developed three separate, but coordinated components. The assessment component includes a set of diagnostic tests that ask students to write compositions about a reading passage. Teachers use a rating guide to provide analytic feedback to students on how well their compositions had a clear main point, adequate support and logical organization. The instructional component suggests general teaching strategies and provides model lessons. The staff development approach is used in the other MAP programs. During the staff development sessions, teachers work with project staff using research-based techniques to develop, interpret and revise project procedures and materials.

In 1982, we initiated the project with approximately 35 fifth, eighth and eleventh-grade English and language arts teachers. The goal of the six-month pilot project was to develop prototype strategies and materials. In the fall of 1983, the project moved out of language arts into social studies. We began working with approximately 25 teachers from the same grade levels to adapt the language arts prototypes to social studies. The project's development is still very fluid and formative. With this in mind, the paper will review some of the literature that bears on the project's form and substance, in particular, and on problems of designing critical thinking programs, in general.

Definitions of Critical Thinking

As a generic term, "critical thinking" seems to strike a common chord of understanding. A close inspection, however, reveals that the general term translates into quite varied sets of classroom activities that call upon diverse cognitive processes and knowledge structures.

Three related, but separate bodies of literature seem to have produced the major concepts of critical thinking. In one approach, writers set out to define critical thinking and deduce more (or less) insightfully, the skills assumed to comprise the construct of critical thinking. Proposed taxonomies or hierarchies of learning that include skills related to critical thinking as part of their more general analyses of cognitive complexity are a second source. A third source is the literature on inquiry and problem solving skill development. Work in each of these areas has influenced specification of the skills proposed for critical thinking, the features of tasks used to teach and test critical thinking, and the instructional approaches advocated for developing these skills.

Analyses of Critical Thinking

A number of writers have proposed finitions and analyses of the critical thinking construct. Some of es writers have looked to philosophies of logic and rhetoric to ien y generalized thinking skills; other writers have looked to the epistomology of a subject domain to identify specific interpretive and evaluative skills; another group has derived its constructs from syntheses of various perspectives; and a final group has simply announced ad hoc definitions and skill lists.

Dewey's discussion of "reflective thinking" in his book How We Think, is a frequently cited definition of general critical thinking skills that transcend the particular conventions of subject domain (Dewey, 1933). Dewey defined reflective thinking as the careful and persistent examination of an action, proposal or belief, and the analysis or use of knowledge in light of grounds which justify it and its probable consequences. He also proposed a five-step process that the critical thinker would use: 1) identify a problem, 2) analyze a problem, 3) suggest possible solutions, 4) test consequences, and 5) judge the selected solution.

Another pioneer in the analysis and evaluation of generalized critical thinking skills, Edward Glaser, propose three components of critical thinking: 1) an attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one's experiences, 2) knowledge of the methods of logical inquiry and reasoning, and 3) some skill in applying these methods (Glaser, 1941).

B. O. Smith also emphasized the judgmental dimensions of critical thinking is his definition, but limited their application to problems of logical reasoning presented to the student, i.e., "what a statement means and whether to accept to reject it" (Smith, 1953). In his landmark paper, "A Concept of Critical Thinking," Ennis further elaborated Smith's view of critical thinking by delineating twelve skills involved in the "correct assessment of statements." Ennis's skills primarily called for the application of rules of formal and informal logic, including making judgments about the logic, validity, reliability and sufficiency of assertions and their underlying assumptions (Ennis, 1962).

Other concepts of critical thinking have attempted to consider its role in particular school subjects. Russell, for instance, discussed the relationship of critical thinking to the development of students' reading skills. The eight skills he identified are still fairly representative of the lists of objectives commonly classified as inferential or critical reading skills. They include abilities to: 1) abstract and organize information, 2) draw inferences, 3) search for relevant materials, 4) evaluate data, 5) compare sources, 6) distinguish fact from opinion, 7) detect propaganda, and 8) apply rules of logical reasoning (Russell, 1965).

Thomas, too, expanded the constellation of critical thinking skills from logical reasoning. Following an extensive review of critical thinking concepts and instruction by Thomas and Taylor (1975), Thomas proposed as an operational definition that critical thinking involved the use of logical or pragmatic criteria in assessing the reliability, relevance, sufficiency, validity or meaning of information and also the use of evaluation strategies (Thomas, 1973).

Hudgins also reviewed conceptualizations of critical thinking skills and attempts to teach them. He extracted four attributes common to the notions of critical thinking he had analyzed: 1) comprehension, 2) use of evidence, 3) evaluation of evidence and lines of reasoning, and 4) awareness of assumptions (Hudgins, 1977). In his view, critical thinking was "a general attitude of searching for evidence relevant to conclusions and that attitude must be supported by an array of intellectual skills germane to the analyzing and evaluation of arguments" (p. 179).

In a recent review of varying concepts of critical thinking, McPeck offers an extensive and thoughtful analysis and critique of prevailing views. McPeck dismisses attempts to equate critical thinking and formal logic as inappropriately rigid and narrow (McPeck, 1981). He also marshalls considerable support for his thesis that critical thinking rests upon field dependent epistomology, i.e., knowledge of the belief systems of a discipline that provide rationales for allowable, legitimate moves from data to conclusions. In McPeck's view, "When a person knows how to suspend judgment for the purpose of using his epistemic understanding of an issue, and does in fact do so, we say of that person that he is a critical thinker" (p. 156).

Throughout these conceptualizations of critical thinking run some common skills. These include: 1) an attitudinal component, suggesting an awareness, a disposition to be reflective; 2) an analytical component involving the identification of relevant information; 3) a component for weighing evidence; 4) a component involving knowledge of pragmatic and formal methods of reasoning; and 5) the act of evaluation. These analyses of critical thinking propose hypothetical constructs that call for empirical investigation. Few of these constructs have been subjected to sustained inquiry, however.

Elements of Cognition

Schemes for classifying and sequencing components of cognitive complexity also serve as frameworks for discussions of critical thinking. In contrast to definitions of critical thinking derived from intuitive and logical analyses, many of the proposed taxonomies and skill hierarchies have arisen from or led to empirical studies. Interpretations conflict, however, over the validity of experimental tasks and findings and their relevance to attempts to define or teach critical thnking in classrooms.

Piaget's stages of development, particularly the distinction between formal and operational thought, are often used to differentiate among problems requiring critical thinking and also to interpret performance (Inhelder & Piaget, 1958). Critics of this line of research contend that the artificial nature of the tasks makes it difficult to construct realistic or academic classroom critical thinking activities that would elicit parallel cognitive operations (Estes, 1978).

Guilford's Structure of the Intellect has also influenced concepts of critical thinking. Four factors relating to some of the 120 proposed intellectual abilities are hypothesized to underlie critical thinking: cognition, evaluation, convergent and divergent production (Guilford, 1956).

Gagne's learning hierarchy is yet another source for analyses of critical thinking. The upper levels of the hierarchy, where students use concepts, rules, and problem-solving skills, have been considered as skill elements of critical thinking (Gagne, 1977).

Bloom's taxonomy of cognitive objectives is the classification scheme most familiar to teachers and most used as a heuristic for defining critical thinking goals. The levels of application, analysis, synthesis and evaluation have been used repeatedly to differentiate among levels of objectives, questions, and instructional activities (Bloom, 1971).

More recently, Craik and Lockhart's notions of depth of processing have stimulated studies of how learners process information. In their scheme, deeper processing and therefore increased learning occurs when learners draw connections among pieces of presented information. By implication, higher levels of thinking are characterized by both the number and type of relationships or semantic networks formed (Craik & Lockhard, 1972).

Sternberg has also suggested a heirarchy of cognitive performances including the components of inductive reasoning, encoding, inferring relationships between terms, mapping higher order relations, applying previously learned relations to new settings, comparing alternative answer options, justifying one answer and combining elements into strategies (Sternberg, 1981, 1983).

Only some of these analyses of elements of thinking or cognition pertain to concepts of critical thinking. Some notions of critical thinking that reference the upper levels of these heirarchies, for example, do not seem to distinguish complex reasoning from the "critical" evaluative aspect.

Critical Thinking and Problem Solving

The line of research on inquiry and problem solving also relates to concepts of critical thinking. While typologies of thinking or cognition focus on identifying kinds of mental operations and their relative complexity, inquiry/problem solving research focuses more on the patterns and sequences in which these component skills are used to solve problems. Theory and research in the problem-solving literature is probably the most advanced in helping to differentiate generalized problem-solving skills from procedures and heuristics unique to the epistomology of a discipline. Research on the processes experts use is providing evidence of a separate, executive program, i.e., experts' self-conscious supervision of the strategies they use as they plan, execute, monitor and revise the procedures they are using to solve a particular task (Chi, Glaser, & Rees, 1982; Simon, 1981).

In definitions of problem solving or inquiry, skills such as weighing evidence and making judgments or drawing conclusions also appear. This literature adds to an identification of skill components and how they are acquired and implemented. Discovery of problems and explanation of alternative solutions are stressed. Within this paradigm, Bruner, for example, stressed the value of having students use the particular inquiry methods of academic disciplines. He identified a set of inquiry skills that included getting and using information, going beyond given information and understanding what makes that possible. He also asserted that children should be at least as self-conscious about their strategies of thought as they are about their attempts to commit things to memory (Bruner, 1966, p. 95).

Suchman stressed the value of an inquiry process that is initiated and controlled by the learner. His main goal was for students to be conscious of the inquiry process. Components of that process included the analytical skills of verification and experimentation and the inferential skills developed by questions of necessity and synthesis (Suchman, 1965).

For Covington, divergent thinking involved in the inquiry process was so important that he deliberately addressed analytic, synthetic and evaluative skills in non-traditional subject areas (Covington, 1968).

Taba, on the other hand, grounded development of the inquiry skills of concept formation and inference and application of principles in a social studies curriculum (Taba, 1963). In a review of inquiry-oriented curricula, Cornbleth identified six elements of inquiry: 1) doubt, 2) clarification, 3) hypothesizing, 4) reasoning, 5) testing, and 6) reaching conclusions (Cornbleth, 1978).

One of the most profound influences on current efforts to conceptualize and teach cognitive skills and on our project's initial efforts to formulate a working definition and framework for critical thinking was the work of Newell and Simon (1976). Their studies have indicated that problem-solving involves recursive attempts to discover a match between things mentioned in a problem statement and the schema and operations stored in memory. As Simon describes the process, the problem solver first must understand the problem, then activate a process of detecting differences, finding relevant operators, applying the operators and evaluating progress. Eventually, the expert routinely recognizes the situation (problem type) and the appropriate pattern of "moves" (Simon, 1981).

These analyses of problem solving have exerted considerable influence on methods used to study the processes skilled and unskilled readers and writers use to understand and produce discourse. For example, planning, construction, evaluating and revising have been used to characterize reading and writing processes (Brown, Campione & Day, 1981; Hays & Flower, 1979; Scardamlia & Bereiter, in press).

Also, researchers in these areas have attempted to describe more consistently the elements of "problem types" presented to readers and writers by turning to theories of discourse structure (Kinneavy, 1971; Toulmin, 1958) and by developing discourse analysis schemes (Meyer, 1975). Toulmin's analysis of the argumentative mode is particularly useful for identifying elements that students would include in their expression of a critical thinking task (their essays). Toulmin proposes that all arguments have essentially the same structure and offers a "lay out" of the components of practical argument. The structure includes: 1) claims-- a position or generalization, 2) data--evidence, 3) warrants--explanations of how data relate to the position, 4) backing--explanation of conditions, and 5) reservations and qualifers--indications of the writer's degree of conviction (Toulmin, 1958). When students are asked to explain their evaluations and interpretations in classroom activities, then, we might at least expect them to use the elements of claim, data and warrants.

Research on problem solving has developed along with a theory of information processing. The coordinated theoretical and empirical work in this area form a very credible framework for defining and developing critical thinking skills.

The MAP Critical Thinking Projects' Developing Construct of Critical Thinking

As we initiated the project in the language arts domain, our working definition of critical thinking was that critical thinking is a deliberate act in which students select from alternative strategies to achieve a purpose. We further proposed that critical thinking develops in the skill domains of reading and writing as students learn to analyze and evaluate text. We have continued to adapt those views

as we design project components to fit within the social studies curriculum.

From the preceding review, we can see that a modified working definition and framework for teaching and assessing critical thinking can draw from each of the bodies of literature. From analyses of critical thinking as a "problem type," emerge a set of defining characteristics of critical thinking. First, to be "critical," thinking tasks or problem types seem to be those that call for making a judgment, drawing a conclusion or forging a relationship. Thus, the goal of critical thinking instruction might be described as the "expression and explanation of an assertion." Furthermore, we would expect the discussion or essay in which a student expresses and explains his interpretation or evaluation of text to contain at least the basic structural elements of a well-formed argument, i.e., a claim (main-point), data (evidence), and warrants (explanations of the relevance of evidence to the claim). As McPeck suggests, the task should permit more than one justifiable answer and the good answer should be judged on the quality of the justification (McPeck, p. 149).

If we refer to taxonomies of learning, we can extract from them some key component skills which students would seem to need to master in order to form and defend their positions. These include component skills or operators such as comprehension/verification of required information and bases and strategies for classification and inferences. Furthermore, these component skills may serve as enabling skills for fashioning and explaining the end goal, and evaluation or judgment. Finally the problem-solving literature suggests that a set of conscious, recursive, basic strategies underlie the development and self-regulation of critical thinking processes: The meta-cognitive processes of planning, constructing, evaluating and revising.

A definition of critical thinking that uses terms familiar to parents, teachers and students, might be, "the deliberate process of constructing and explaining interpretations and evaluations." The elements we expect students to include in their constructions are: topic statements, credible evidence, explanations, and conclusions. The process of critical thinking involves: planning, constructing, evaluating and revising strategies; skill domains or "problem types" might include: summarizing, classifying, inferring, and evaluating.

Furthermore, for the critical thinking process to become a routine approach, the processes of planning constructing, evaluating, and revising should serve two functions, 1) to help students develop habitual patterns of approaching critical thinking tasks, and 2) to help students develop a reflective, self-monitoring strategy for thinking about how they successfully use these processes.

Assessment of Critical Thinking

A number of factors influenced our design of the assessment component. First, we came to the project sharing the district's

commitment to the view of assessment as an integral part of the instructional system. We were in complete accord with the other MAP projects and the mastery learning model that the function of the assessment was to monitor progress, diagnose problems, inform instructional decision making and provide formative evaluation for program improvement.

One implication of this view is that testing should match instruction--what Skinner had described as one more unprompted trial of the terminal behavior (Skinner, 1968). Like the instructional activities, then, the assessment must also permit students to construct and explain their interpretations and evaluations of what they read.

In order to design assessment forms for each of the skill areas (summarize, classify, infer, evaluate), we drew from methods of domain referenced testing, i.e., defining the characteristics of text passages and questions that would guide writing the tests (Baker, 1974; Hively, 1974; Popham, 1978; Quellmalz, 1978). One of our goals for the project was to specify task domains so that we could develop a homogeneous pool or bank of activities that could be used for instruction or assessment.

Another implication of the view of testing in the service of instruction is that the diagnostic function would provide maximum information by presenting an analytic profile of the essay. Therefore, the project adapted the hybrid holistic/analytic rating strategy developed as part of the Writing Assessment Project at the Center for the Study of Evaluation (Quellmalz, Capell, & Chou, 1982). The intent of the guide is to provide information on the essay components of focus, support and organization, as well as a holistic judgment of how well the essay orchestrates these components to address the assignment (Quellmalz, 1981). the resulting score profile enables teachers to focus class and individual instruction on areas requiring further development.

Critical Thinking Instruction

As we might expect, the broad spectrum of critical thinking definitions has fostered a variety of attempts to teach these skills. Some instructional efforts focus on strategies for critical thinking systemic to a particular discipline, others allege they promote generalizable critical thinking skills. Programs differ in their scope, as well as in the nature and amount of support they provide in the way of teaching strategies and instructional activities. Critical thinking projects also vary considerably in their attempts to link teaching procedures to instruction and assessment. Unfortunately, data documenting a programs's implementation and effectiveness are often absent, incomplete or based on poorly developed or selected measures.

The design of the instructional component draws from the literature of instructional design and learning research those techniques which had the strongest research base supporting their usefulness in teaching

complex reasoning skills in the classroom. Although our general approach incorporates techniques drawn from learning theory and research, the specific instructional strategies and material formats continue to evolve from our collaboration with district teachers and staff.

Implications of Cognitive Learning Research for the Design of Critical Thinking Instructions

Critics of the behavioral model for designing instruction have objected to its tendency to focus on lower-level skills and to its view of learning as a passive, input-output process. Cognitive psychologists have rejected the emphasis of behaviorism on overt, observable responses at the expense of covert, hypothetical mental operations and knowledge structures that combine to produce observable responses. Cognitive psychologist's view of learning as a constructive, generative process in which the learner assimilates new information into existing knowledge frameworks or schemata has produced research findings which are particularly relevant to the design of critical thinking instruction.

First, the cognitive paradigm revives the distinction between the psychological processes involved in recognition vs. production and corroborates the greater diagnostic value of constructed response measures--a distinction particularly important to critical thinking information.

Second, studies of instruction in text comprehension (e.g., Brown, Campione & Day, 1981), and writing (e.g., Scardamalia & Bereiter, in press), reveal that students can learn to improve their planning, executing, monitoring, or revising skills. There has been less classroom research however on improvements in domain-independent, metacognitive skills where students "step back" and reflect on the state of their own knowledge base and strategies available to face task demands. These meta-cognitive skills are similar to the self awareness Bruner recommended that children should have about their own strategies of thought (Bruner, 1966).

The implications of cognitive research for critical thinking instruction, then, are that students might well benefit from instructional activities in which they practice and receive explicit guidance in strategies they might use to plan, construct, assess and revise their interpretations and evaluations. Furthermore, these instructional and assessment activities should emphasize constructed responding and still use the core instructional techniques of orienting stimuli, instructional cues (particularly modelling), practice and feedback. These instructional variables continue to surface as effective techniques in cognitive training studies (e.g., Brown, Campione, & Day, 1980).

Approaches to Critical Thinking Instruction in the MAP Critical Thinking Project

Our general instructional approach has been to design lessons where students express their understandings, interpretations and evaluations

of passages by engaging in the process of planning, "doing," (i.e., reading, discussing, writing), evaluating and revising. Typically, students are presented with a writing or discussion assignment for one of the four skill areas (summarizing, classifying, inferring or evaluating). Following the techniques of Hunter's lesson design model, students are presented with the objective of the lesson in order to focus their attention on the goal. Before reading, the teacher may "elicit appropriate schemata" through an introductory discussion of students' background information about the content of the passage and, when appropriate, its source, (e.g., a biased observer) or structure (e.g., an editorial or a diary entry). Students plan to read by using strategies to determine what information in the passage would be most relevant to the writing assignment. After reading, students review passage content to check for comprehension, then engage in a variety of planning-to-write activities that include discussing and outlining relevant evidence. The students write the essay, it is evaluated by the teacher or students according to scoring guide criteria and may be followed by a revision activity focused on one or more elements of the essay or on the procedures students used to find and incorporate appropriate information in the essay. The instructional techniques of teacher input (cues and models), practice and feedback then are included in the model lessons as they are appropriate to the class's skill development level.

A major contribution of cognitive research to our approach to designing the instructional and testing systems has been the notion of distinguishing among task or problem types. Like the specification of assessment problems, instruction on critical thinking, then, must precisely link the required "thinking" skills to the bounded problem domain.

The Context of Critical Thinking Instruction

Perhaps one of the most essential, yet neglected factors in the design of a critical thinking program is the institutional context in which the program must operate. Many of the innovative programs developed in the 1960's failed to survive after specialized support and funding ceased. This may have been due, in part, to the programs' failure to consider aspects of the organizational context.

At the classroom level, the problems could include a cumbersome managerial system, an orientation at odds with the philosophies of the teachers or curriculum, or content that is viewed by teachers and/or students as tangential to required course goals or that is considered boring or irrelevant. Also the program may not provide sufficient guidelines, supporting materials or consulting help. Conversely, the program may have been designed to be so "teacher proof" that the activities do not permit sufficient flexibility to meet the needs of different teaching styles and groups of students.

Studies of the implementation of innovative programs at Rand and analyses of implementation data from the Follow Through Project

indicated that variations in the use of a single program within each site were as great as variations between sites (Berman & McLaughlin, 1977; Kennedy, 1978). The implication of these findings is that teaching procedures must provide enough support for teachers to use them as they are, yet enough flexibility to allow teachers to tailor their instruction to their classes. Another implications is that involving classroom teachers who are in the operating system in the development of the instructional system may help assure program appropriateness and acceptance. The MAP projects use such a collaborative strategy as one of their development techniques.

At the school and district levels, the program may not receive the support of administrative staff. This may be the result of poor communications or the lack of support for the program from other levels of the administration. In Pittsburgh, the MAP projects address skills identified in a district-wide needs assessment and then mandated by the school board. Therefore, they receive full administrative support. In fact, we are fortunate that Pittsburgh's district context has many of the features Bank and Williams (1981) describe as characteristics of "heroic" districts that manage to use testing to improve instruction. Some of these features are: 1) the support of anidea champion, 2) a commitment to testing in the service of instruction, 3) and a strong staff development program.

In sum, program failure can often be traced to context insensitivity. By developing the project within the school district, we are trying to build a program sensitive to district concerns and strengthened by the talent and expertise of its personnel.

Analysis of Resources for Teaching Critical Thinking in the Classroom

The review of resources available for teaching critical thinking in the classroom, examines several elements: 1) the skills proposed as elements of critical thinking, 2) the kinds of tasks set to elicit the skills, 3) the inter-relationships of teacher training, instructional materials and assessment, 4) use of research-based instructional techniques used to teach the skills in relation to ones which we had identified with a research base, 5) the role and structure of assessment activities, and 6) whether there was evidence of the effectiveness of skills development, variations in instruction, and acceptance by teachers and students.

Resources developed to teach critical thinking skills in the classroom vary along a number of dimensions. One dimension is the intended function of the resource. The resource may be a curriculum project which presents teachers with strategies and activities to achieve a set of specified outcomes. These projects can further be differentiated into ones embedding critical thinking within a standard school subject such as science or social studies, or ones designed to teach generalized critical thinking skills.

In-service, staff development programs are another set of resources developed to help teachers teach critical thinking in the classroom. These staff development projects may also either focus on a variety of techniques for teaching critical reasoning skills, or be limited to questioning techniques.

Some textbooks present guidelines for teaching critical thinking. These may review critical thinking concepts and studies of critical thinking and describe exemplary techniques. Others present one particular program. A third text type presents questioning strategies.

The last resource materials are courses of study and sets of objectives. These materials differ in the range and interrelationship of critical thinking skills proposed, in focus, and in the amount of guidance and supporting information they present for instructional strategies and activities.

Because of the array of resources potentially relevant to critical thinking instruction, this review only considers curriculum projects with certain characteristics. Of most interest are resources designed to be used by teachers and students and that attempt to deliberately train the development of critical thinking skills. Although some of the particular techniques and instructional materials in the other resources may have implications for classroom lessons, experience also suggests that teacher workshops or courses of study and textbooks, in isolation from on-going curricula, have a low probability of classroom application.

Unfortunately, in many cases, copies of the manuals and student and teacher materials of curriculum programs were not available as primary sources for these programs. Therefore, this review often had to rely on descriptions of the projects in secondary sources. These descriptions often did not provide information about important program features. In the aggregate, however, the program descriptions allowed reasonable comparisons between the initial design of the MAP Critical Thinking pilot project and other efforts to teach critical thinking in the classroom.

Curriculum Projects

A number of curriculum projects have attempted to foster critical thinking. Hudgins (1977) reviews studies from the 1930's and the 1940's. He describes a program designed by W. Glaser in 1941. Glaser developed a semester English course of eight units promoting skills related mostly to logic or detecting propaganda. The program was inserted into a regular English curriculum, but the materials were only remotely related to the usual method of analyzing essays and newspapers. Hudgins does not describe the nature of the materials or the instructional techniques other than to indicate that Glaser provided a complete set of materials and references for reading. Apparently, with "careful planning" the teacher could present a self-contained critical thinking program. In

Glaser's study of the program, the experimental classes outperformed control classes on an undescribed test. No information about teacher and student reactions to the program was reported.

In the 1960's and early 1970's a number of curriculum projects appeared using an "inquiry" approach. Among those using the approach to help students develop skills in the scientific method were the Biology Science Curriculum and the AAA Science: A Process Approach. These projects usually presented students with laboratory activities where students "discovered" scientific principles of the subject domain. Evaluations of these projects did not appear in the published literature, although a few writers suggested that the programs' procedures often distracted students from the intended outcomes because students became fascinated with the laboratory equipment. Critics also felt that the discovery processes were unnecessarily time-consuming.

Suchman's Inquiry Training Program (1965) was a fairly well-documented inquiry-oriented science program. The program was designed to help sixth-grade elementary students discover basic physics principles. The 24 weeks of instruction presented film clips demonstrating physical phenomena which students first watched and then tried to explain. Students then asked a series of "disciplined" questions. During the three stages of a lesson, students were encouraged to ask verification quesitons during episode analysis (understanding elements of the problem), questions to determine relevance during the next stage and, finally, inferential questions trying to induce relational constructs. The teacher's role was to provide feedback through "yes" and "no" replies. The program had an eight week inservice program to train teachers how to interact during the lessons. The progam measured its outcomes by looking at students' conceptual mastery and application of the physics principles and by analyzing protocols of the questions students asked about a film. Students in the experimental classes only outperformed control classes (which had viewed the same film but were taught the principles directly) in the number of verification questions and in the total number of questions asked. These results provide some weak evidence that students can be encouraged to self-initiate initial portions of the inquiry, information seeking process.

Social studies is another subject in which curricula tried to foster critical inquiry. Bruner's Man, A Course of Study, was one such program; Taba's elementary social studies program is perhaps most often cited. Taba's program emphasized social studies concepts and inferences. Teacher training was carefully designed to reinforce procedures in the curriculum and criterion-referenced program tests were developed. In a year-long field study, experimental classes did not significantly outperform control groups, but methodological problems in the conduct of the evaluation may have obscured differences. In addition, the evaluation did not collect observations or interview/questionnaire data about the implementation of the instruction, therefor, it was difficult to interpret results.

Other curriculum projects couched their instruction on critical thinking in non-school subjects. Covington's Productive Thinking

Program followed the general approach of the other inquiry programs, but was purposely divorced from traditional subjects (Covington, 1968). The "Making Judgments" Program developed by Thomas and his associates embedded its instruction in critical thinking in common occupational areas where employees must evaluate information according to known rules or conventions. This program produced a five-unit package on techniques of advertising, causation in research studies, conflict in arguments, evidence and testimony in the courts, and facts and opinions in news reporting (Research for Better Schools, 1979). The lessons were self-programmed books intended to be self-administered and paced and were accompanied by pre- and post-tests. Thomas reports that pilot data showed experimental students outperforming control groups and that interviews with students and teachers and classroom observations indicated a positive reception of the program. An external evaluation of the program by Baker, however, using tests from the program and specially developed criterion referenced tests, showed less clear-cut advantages (Baker, 1975).

Several major curriculum projects, particularly the Illinois and Cornell Critical Thinking Projects, attempted to teach critical thinking as logical reasoning. In the Cornell Project, for example, secondary students received written exercises of 1-2 pages which presented definitions of terms and brief problems asking students to practice such skills as labelling premises and conclusions. No evaluation of the project's effectiveness, use or acceptance by classroom teachers was found in conventional published literature.

Hudgins describes short term (five lessons) programs by two students of Peel that attempt to teach thinking skills to adolescents by having them analyze the logical aspects of verbal problems. The program presented brief exercises and multiple choice questions about their analysis. Both studies showed significant gains by the experimental students over controls, but no evidence of transfer (Hudgins, 1977).

In yet another attempt to teach thinking skills, Edward de Bono devised the CoRT Project which aimed to give teachers a general framework for helping students use particular strategies or tools. These tools are unusual representations of a potpourri of informal heuristics for viewing arguments. The procedures have names such as "the bird watching method" or the "north-south method" in which students are to use a tool called ADI where they look in the direction of Agreement, then Disagreement, then in the direction of the areas of Irrelevance. the instruction uses a "tell, show and do" approach in small group discussion where students respond to a set of problems calling for use of the tool. DeBono described a series of studies of the program with students of various ages. He analyzed protocols of discussion sessions and reported that program pupils made fewer initial and instant judgments and were more inclined to generate points on both sides of a question. De Bono also listed student and teacher comments indicating that students felt they thought more "deeply" during the lessons, were not conscious of using the techniques in their other

school subjects, but did not seem to use the techniques out of school (De Bono, 1976). Tripp also reported a formative evaluation of the CoRT program in which pupils produced more ideas of an apparently higher quality, but closer analysis revealed that, in some cases, these ideas were not generated by using the program's "thinking" tools and that the structured discussions alone, without training on the tool might have produced the results (Tripp, 1980).

A series of fairly recent projects is beginning to receive attention. Among these are Project Impact which focuses on role-playing, problem-solving situations in a local community context, materials based on Guilford's structure of the intellect produced by the SOI Institute, and lessons on strategic reasoning by Innovative Sciences using six problem-solving techniques suggested by Albert Upton.

In general, most of the programs reviewed have not succeeded for a number of reasons. First, most projects, perhaps with the exceptions of Suchman's and Taba's programs, were not accepted as regular courses in the school curriculum. This may partly be due to the development process, i.e., the projects were developed outside the system, and partly because of the artificial nature of the tasks. Second, many projects did not provide sufficient instructional materials and strategies for teachers to use or adapt the programs readily. Third, in many instances the instructional designs of the programs did not seem to use core instructional techniques systematically, particularly instructional cues, and modelling; most programs also did not tend to provide practice and instruction on all aspects of the thinking process, i.e., planning through revising. Most of the programs did not provide instructional experiences of sufficient length and scope to move students through stages of initial skill acquisition, development, and maintenance, let alone, transfer. Fourth, the programs failed to develop or use valid, useful measures of skill development and the instructional process. Without these forms of sensitive documentation, the programs lacked defensible bases for individual diagnosis and monitoring, or for program improvement and validation. Finally, the programs often failed to allow for enough flexibility to accommodate the dynamics of the contextual system in which they operate.

Summary

The task of designing an integrated instructional and assessment system for critical thinking poses a formidable challenge. School systems must decide whether they want to teach critical thinking as generalized or curriculum-embedded skills. Schools must also specify the set of component skills the critical thinking program will teach and test and the range of content and activities in which students will use critical thinking skills. The specified set of skills and tasks can then focus efforts to select or develop appropriate coordinated testing and instructional activities. School systems can draw

upon research from the fields of learning, instruction, and program implementation to select or develop curricula that will offer sufficient guidance, practice and feedback to teach the skills and that will be appropriately tailored to the system and classroom contexts.

Although myriad bodies of research can inform the design of critical thinking programs, systematic study of effective teaching strategies and instructional activities is desperately needed. Efforts such as the Pittsburgh MAP Critical Thinking Project are attempting to use available research to develop such an effective program.

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CHAPTER 5

STAFF DEVELOPMENT

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"The business of getting better doesn't happen in big ways. Learning in classrooms happens in the moment-by-moment interactions between teachers and students. Similarly in schools, if we are to get better, it's likely to take lots of small trials. With lots of small trials the probability of a few successes, a few accomplishments, goes up."

"Schools are organized to do lots of things, but getting better steadily often isn't one of them. The relevant principle of organization is this: if time, space, materials and people are not organized in a way that permits professional development to compete with other obligations, it will add up to naught."

"The real world of classrooms will always be more complex, more challenging than we can represent on paper by the findings from research. The only way we will discover how theory and research are 'practical' is to collaborate in preserving a set of principles or a set of ideas long enough to get them tested, and while preserving the integrity of the real world setting."

"Getting better together ought to pay off in large and small ways for students, teachers, administrators, schools and communities. The challenges we set for ourselves, the demands we place on ourselves and others, must be matched by the level of support and reward we are prepared to offer."

MOVING TOWARD CONTINUOUS SCHOOL IMPROVEMENT

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There's a scene in the movie "Butch Cassidy and the Sundance Kid" in which, in order to get a job (as a payroll guard!) the Sundance Kid is handed a pistol and told to shoot at a coin lying 50 feet or so down the dusty road. So he stands there stiffly, points the pistol, shoots and misses by about three feet. The boss shrugs in disgust and starts to walk away, while the Sundance Kid stands there and says, "Can I move?" The boss says, "What do you mean?" and the Kid crouches down, draws his gun, shoots rapid-fire and sends the coin flying. Then he stands up and says, "I do much better when I move." Well, I do much better when I move. I'm a pacer and I'm rather chained to this microphone this morning so I hope you will be tolerant as I curb my desire to pace up and down and join you in the audience.

A good classroom teacher or a good principal sometimes has to have the willingness to stand up and look like a fool in front of a lot others. I think on this rainy Thursday morning we ought to share that risk of making fools of ourselves and so I'm going to ask you to join me in something. I'm going to ask you to join me in taking the notion of a "keynote" seriously. All right. Are you all awake and there? Let's try this together. I sing in the key of "L" and probably lots of you do, so don't be afraid. MMMMMMMMMmmm (audience hums). Very nice! Now I also know that as children in our society some of you could not escape exploiting your talents and learning additional skills. Some of you--and you know who you are--can sing in harmony. So let's try one more time with more richness and fullness. MMMMMMMMMMMMMMmmmm (audience hums in harmony). See what we can do together? I love it! I got that idea for taking the keynote seriously from my friend and colleague Tom Bird. The nerve to try it I had to drum up all by myself. I did it for three reasons. The first is that some achievements require the energy of more than one person. I wanted to alter the situation at a conference like this, for example, in which the person honored with starting the day also assumes the full burden of establishing the meaning and momentum for that day. So you've now shared in establishing some of the meaning and momentum, and that principle applies to all of our work. Second, we have just shown that you don't have to have a flawless performance to get started; rough edges are all right. We can go ahead and get started with small trials even when we're somewhat uncertain of our ground and clumsy in our efforts. And third, if we can't behave oddly enough to change how we conduct a meeting like this among ourselves, we certainly can't behave oddly enough to change how we work in schools. So with that

prologue I'd like to state some articles of belief that establish a context for what I've learned in trying to get close to the practices of professional development.

Number One: I've come to be a firm believer in big ideas and small tactics. In recent years, as the work on effective schools and effective teaching has been widely publicized, we've come again to share an optimism about what schools can accomplish, an optimism that was sadly lacking for some time. That optimism restores our faith and confirms our experience that the things that make a difference to student learning are under the influence of people who work in the schools. At the same time, the business of getting better doesn't happen in big ways. Learning in classrooms happens in the moment-by-moment interactions between teachers and students. Similarly in schools, if we are to get better, it's likely to take lots of small trials. With lots of small trials the probability of a few successes, a few accomplishments, goes up. With lots of small trials we're also going to have failures worth celebrating. It's that moment-by-moment experimentation that adds up over a period of time. That approach will take a perspective that's a little bit different from the one we ordinarily apply. It's going to take a certain playfulness with our ideas, a playfulness with the idea of experimentation. That runs counter to a lot of our self-imposed seriousness about education. I once came to wonder why it is that educators, unlike physicists, don't show much playfulness about their ideas. Look at the discoveries in physics and the imagery that's conveyed in the way that physicists label what they're finding: quarks, strangeness, black holes. We don't have the same kind of high imagery in education, but we ought to attempt to foster it, together with a shared language for describing, analyzing, and unraveling the problems of teaching and learning. Others have reminded me that education, second only to the ministry, holds a sacred trust--the education and care of the young. Communities and parents hold us seriously accountable for our efforts, and the notion of being playful in that context is unusual, difficult. I would propose that in rooms like this, however, we can afford to be playful. And that the playfulness that we exhibit here will allow us to be serious in our efforts in classrooms when in fact we are in contact with children.

A second article of belief is that getting better is driven irretrievably by belief, value, initiative and nerve, and there is no substitute for those. Someone out there, some persons, some groups, have to have the guts to get started and faith in where they're headed. They have to pick something worth trying and do it even when they're uncertain of the outcomes. In the absence of that initiative, all of the technical knowledge and skill that we've been working at building, all of the thoughtful organization will prove sterile.

Third, there's no such thing as neutral except on a car. There is no neutral instance of professional development. Every occasion that we have of working together as professionals will either build

our commitment to professional growth, to a vision of teaching and teachers, or it will erode that commitment. There's no half way. I'm talking about professional vision, professional commitment. We can't go on assuming that we can fill inservice "slots" on the grounds that "Oh well, it may not help but it can't hurt." It can indeed hurt. Every encounter we have with one another will build our commitment and our investment, or it will erode them.

What does that do to staff developers? If there are staff developers in the audience, you all ought to be hiding under your chairs at this point. What I want to introduce as a caveat here is that "having no such thing as neutral" is not the same as a requirement for a smooth, polished performance. In fact, we do ourselves a tremendous favor by letting the rough edges show, as you did this morning by singing out. Rough edges give us a way to hang on to each other, to grab on to each other's understandings, to find a way to connect. The smooth polished performance leaves people saying, as it does in some demonstration teaching, "That was wonderful, but I could never do it."

We have, then, a set of beliefs that add up to this: there is power in shared value, shared commitment. There is power in a shared language for carrying on with our work, for describing, analyzing and refining the work of teaching together. And there's power in the notion that small events add up to something big.

In the remarks that follow I'd like to work back and forth between broad principles and a set of concrete specific examples.

With respect to broad principles I am led to try and back up some claims about collaboration and collegiality. Because collegiality and collaboration form such an attractive set of images, we have even more of an obligation to explore what it takes to live them out in practice. So let me start first with the notion of organization. Schools are organized to do lots of things, but getting better steadily often isn't one of them. The relevant principle of organization is this: if time, space, materials and people are not organized in a way that permits professional development to compete with other obligations, it will add up to naught. It's a matter of the economics and politics of staff development. We must concentrate professional development in the ordinary week-to-week opportunities of people working with one another. Concentrating on how to revise the five percent of time that we have people captured for organized inservice, rather than concentrating on the 95% of the time that they spend in the work day at schools, is to miss a tremendous opportunity. I'd like to give you several large and small examples of what that might mean in practice.

At the district level, it simply means that whoever's in charge of staff development ought to be simultaneously responsible for curriculum and instruction. If staff develoonment as a function in a district is not integrally tied to the obligations of the instruc-

tional program and to the rewards and obligations of teaching, there's very little reason for anyone to take it into account.

At the building level, there are small examples that illustrate how small decisions make a difference as to whether or not people will work together to get better. Let's try the copying machine, the bane of everyone's existence. A portrait of two schools: in the first school, with a faculty of nearly 100, there are two small copying machines. One is located in the teachers' lounge and the other is located in the main office. Each one is of a size adequate to serve the needs of a small, not very successful, real estate office. An observer can sit in the teachers' lounge and watch the teachers trail in during their planning period. They come in with worksheets to copy, and they stand in line for the machine. Their first question is "Is it working?" Teachers have one planning period a day. That one period a day over a week's time adds up to several hours of available time for professional work of all sorts. To spend it standing in line for a copying machine seems a tremendous waste of professional capital. Now let me give you a portrait of another school. This is a junior high with a faculty of 50 that has a very large reducing and collating copier. It is staffed by two aides who receive orders for copying from teachers. Every teacher in the building feels adequately supported. Every teacher in the building has the time to make use of common planning periods. Small decisions about money add up to big opportunities.

Another example of the principle of organization. This has to do with the way that people cast problems and solutions. In one district, the teachers' union has negotiated a provision for "class size relief as a way to relieve the burden on teacher time." That means that a teacher or a group of teachers can apply for money from a fund to supply teacher aides, lay readers for the English department, that sort of thing. A teacher is expected to have compelling circumstances to capture some of that money. The result in that district is that interpersonal competition is increased, not decreased, and the planning burden is relieved for no more than five percent of the teachers. By contrast, a staffed workroom and copier has the effect of relieving the planning and preparation burden of <u>every</u> teacher in the school, measurably increasing teachers' willingness and time to work together.

The third example of organization: observation for fun and profit. There's been a lot of enthusiasm lately for getting principals and peers into classrooms. Help me out. Give me an estimate of how many times I would have to visit a classroom for you to trust me to make some kind of meaningful comment on your teaching and give some meaningful advice. How many of you think I can do it in one visit? How about two? We have a couple of takers for two. Three? Okay, a few more. How about four? Okay. How many teachers are in the audience? Not very many. Teachers tell us they'd be confident in us after three or four visits. They feel even more confident if an observer is there several days in a row, preferably

at the beginning of a unit, in order to get a sense of continuity and depth.

In a high school with a faculty of 80, what would it take to do observation and feedback on a scale large enough to make a difference? If the principal alone does observation and feedback, and does one observation a week, it would take over two years to get to everybody at least once. At that kind of level, a teacher's experience of observation and feedback is likely to be by rumor, not experience. How many people would have to be involved to start to produce observation on a meaningful scale? Three people, each observing three times a week, could get to everybody once every two months. On that scale, observation may start to be a meaningful event. The issue here is whether there is a plausible connection between organizational arrangements we make for professional development and the professional improvement outcomes we desire.

The uses of discretionary time reveal something about those "plausible connections." As a condition of professional development in buildings, we talk about shared planning and preparation, the opportunity to talk concretely about teaching. People say, "yeah, but when do you do that?" Well, the answer is that if you don't do it in the school day, you're not going to do it in any kind of meaningful way. That raises the issue of common planning times, time during the school day. There are a lot of things that stand in the way of organizing time when people can regularly and frequently get together to talk about their work and to plan it. In one junior high it took 18 computer runs to manage a schedule in which at least 88-90 percent of the kids got the schedule configuration that they needed. And all of the core academic departments also had common planning time. But because common planning was viewed as important in the order of priorities, people kept at it until they got it. In high schools where there is a tremendous proliferation of elective offerings it gets harder still. You can go for the aim of having common planning time for subsets of people who actually have a reason and an interest in working together on something. Elementary schools pose a different problem; very often they don't have any time during the day. But if you set it as a priority, you'll locate opportunities: rearranging faculty meetings so that they deal with only the business of teaching; organizing grade-level meetings so that they deal with only the business of curriculum and teaching; scheduling the instructional day to permit a common planning time before school begins. Finally, we can make systematic rather than idiosyncratic use of release time. In many districts, we offer chances for people to pursue individual courses of professional development. I would simply argue that if we want the uses of release time to add up to a difference in our schools, then we ought to think about asking, as part of a proposal to use release time, that people be able to demonstrate how it's going to contribute to the work of this place as well as to the work of this person. That wherever possible we use district-funded release time for groups or

teams, not individuals, and that we find a way to get individual credit attached to group efforts.

Now let's turn to matters of knowledge and skill. In staff development, we know a lot about the design of good skills training. We don't always have the time or energy or staff or materials to do the job we know how to do. There's some slippage. And the outcomes we're after do not always lend themselves well to skills training. But when such skills training is appropriate, we know something about how to design it: we know tc make outcomes clear, to model the recommended practices as trainees, to demonstrate them as they would be used in classrooms, to provide supplemental materials, and to organize opportunities for practice, discussion and problem-solving.

What happens to staff developers who try to do that day by day? Here are some of the practical problems that seem to arise for people when they struggle to make the best use of what they know. One of the problems is that it is very hard to model fully in training the range of instructional practices that you want people to use. Classroom management is a good example. If I am to model fully a set of proactive classroom management strategies throughout a training session with adults, I have to be prepared to treat a room full of adults as if they were eighth graders. Now I don't mean "talking down" to them. I do mean taking every opportunity to model strategies for keeping everyone engaged. That may mean calling attention to strategies for getting participants out from behind newspapers, or for redirecting side conversations, or for insuring full participation in groups. It's very hard to do because it violates norms for what "inservice" is like.

A second problem that people face in doing adequate skills training is getting materials, examples and exercises that fully capture the range of instructional circumstances represented in the room: all of the grade levels, the subject areas, the levels of ability. This underscores the fact that staff developers cannot do the job alone, and it underscores the trap that we find ourselves in when we try and establish credibility with teachers. Staff developers feel this tremendous obligation to establish themselves as knowledgeable, to convey the impression that they have "been there." One of the ways to convey the impression that you have "been there" is to have enough examples from different classes and different levels and different kinds of schools, to give the texture of school-life in your presentations. That is credibility based on familiarity: "I understand." A second, and more powerful basis for credibility arises out of a thorough analysis of particular problems in curriculum and instruction. The latter is built on an in-depth shared knowledge of the relevant curricular or instructional issues, on shared involvement in work that extends beyond skills training to a conceptual grasp of key problems and principles. And no staff development office will ever be able to do that alone, thus bringing us to the principle of collaboration.

Collaboration is a wonderful image. It says to people, "We're interested in you. We think that you're doing something worthwhile, worth looking at, worth learning from, worth joining in." Viewed in one way, collaboration is a form of politeness and consideration to people. To speak of collaboration is to convey your intent to do good instead of harm to those with whom you work, and to treat all partners as knowledgeable contributors to a joint venture.

I would like to make the claim here, however, that collaboration must be something more. No matter how definitive, how solid our technical knowledge becomes, how much faith we have in the findings on effective teaching, those findings will always be inadequate to account for all of the occasions in which they are applied. The real world of classrooms will always be more complex, more challenging than we can represent on paper by the findings from research. The only way we will discover how theory and research are "practical" is to collaborate in preserving a set of principles or a set of ideas long enough to get them tested, and while preserving the integrity of the real world setting. Simple etiquette, while important, will not take us far enough; in fact, it may lead us to compromise prematurely. If we can separate the language of practices and consequences, the tools of our trade, from people and their competence we may manage to develop thick enough skin to work together in enough detail, with enough persistence, enough humor and enough tolerance to struggle through to application.

The principle is this: successful professional development will require a set of social relations among us all as colleagues, characterized by reciprocity and respect. These are relations summed up by teachers as trust. Think a minute about what you mean by trust. When I say I trust people, what I usually mean is I have known them long enough that I trust them to do well by me. I trust them not to harm me. If they do harm me I trust them not to have intended it, and I trust them to work with me to repair or restore the relationship. In our work with one another, we have the challenge of finding a substitute for trust based in long-term intimacy.

Let me just share with you a few of the ways that colleagues establish trust. They share obligations and risks. I'll use an example based on observation. Teachers trust observers when it is eminently clear to the teacher that the observer is working as hard to do a good job at observing as the teacher is working to do a good job at teaching. As an observer, I have the obligation to capture that class for the teacher, to be eyes and ears for that teacher. If I fall down on that obligation, I expect to hear about it. We share in the obligations to do good work, each from our respective position as teacher or observer. We also share in the risk. For example, it ought to be clear to the teacher that the observer is open to instruction too. So, every time we talk about your teaching we also talk about my observing. It's a shared participation in the risks, in the obligations and in preserving high standards of professional

work. The second aspect of trust is opportunity for influence. If we are full professional partners in this then we both ought to have a say in what we are looking at, how we are looking at it, how long we look at it, what kinds of discussion we have later, what the consequences are. A third aspect of trust is the predictability of criteria and procedures. In the absence of certainty about what's "right" and in situations where it's easy inadvertently to hurt one another's feelings, it helps to be able to fall back on certain agreements that are firm. That gives us a way to talk about our difficulties and errors. A final contributor to trust is separating the language of practice from the language of people, and concentrating on the former.

And now we turn to matters of leadership. The central challenge, or principle, revolves around the shaping of meaning, values and belief. The practical problem is maintaining a visible order of priorities amid the press of competing obligations and demands. Successful leaders (including successful classroom teachers) appear to live by four rules of thumb. The first rule is, "If you want it--whatever it is--say so." Make the values public and specific; the "implicit" goals cannot begin to compete with those explicit obligations that place demands on people's energy and time. A second rule of thumb is, "If you want it, teach it." Describe it, train for it, model it in practice, show it in day-by-day and moment-by-moment interactions with one another. If we want to hold out a vision of a collegial and rigorous profession, then our daily interactions with one another must have that character. A third rule of thumb is, "If you want it, organize for it." In the absence of opportunity and organization, public declarations are meaningless. It is fruitless, for example, to tout the virtues of collegiality in schools if we are unwilling to carve out common planning times for teachers during the school day, every day. There will be trade-offs with respect to money, materials, people, time and space, and the choices that are made will reflect the "real" order of priorities. Finally, the fourth rule of thumb is, "If you want it, reward it." Getting better together ought to pay off in large and small ways for students, teachers, administrators, schools and communities. The challenges we set for ourselves, the demands we place on ourselves and others, must be matched by the level of support and reward we are prepared to offer. And on that note I'll let you get coffee.

"Here is my three-point summary of where we stand today. One, the public is demanding more than ever before and receiving more. Two, they are giving us less money to do it with. Three, they are criticizing us more for it. But my impression as I move around is that a lot of us are more burned up then burned out about the situation."

"The only way that we as educators are going to meet the present demands is to become more efficient. This is not a word we like. We tend to shy away from it. But the inescapable fact is that we are going to have to get more results from the resource · that we have."

"The local school workplace needs to become a growing, renewing, learning, problem-solving environment for everybody in it — not just for the kids, but also for the teachers and the principals as well."

"Schools have either an energizing environment, a maintenance-oriented environment or a depressant environment. The aim is to move to an energized environment if you do not already have one."

EFFECTIVE STAFF DEVELOPMENT

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Considering the long time that I have been at this business, you would think I would have probably said it all by now. But, let me assure you that I have recently been engaged in some work that I have not talked about or written about before, and I am delighted to have the opportunity to share it with you.

My topic today is effective staff development. It translates into this question: How can we--teachers, educators, administrators--continue to improve our skills and to grow as professionals throughout our careers? I submit that this is one of the most vital questions facing American education today. And if we can find some successful answers to it, it seems to me that it will go a long way toward helping to solve the problems both of quantity and quality in our schools and in supplying educational personnel to staff them.

Before I get to the heart of the research, I want to blow off a little steam regarding the predicament in schools today. Are we in a crisis? Are the schools a disaster area? Have they and do they put the nation at risk as has been so prominently discussed in current reports? Are we about to be overtaken by the Japanese? I remember 25 years ago it was the Russians, and 20 years before that the Europeans. I wish I had time to sketch some historical background of where we have come with our school system since we brought it over from Europe and transformed it into an indigenous institution because I think there are some very important lessons as we consider what we are doing now. I am an historian and I like to do that, but that was not what I was invited to do. Ask me again sometime and I will.

Is the nation at risk? If the question is, "Is the nation at risk because our schools have done such a bad job?", the answer is a resounding "no!" If on the other hand the question is, "Is the nation at risk if we do not support and substantially invest more resources to make the schools as good as we can?", then the answer is a resounding "yes"!

Bud Hodgkinson, writing last year in PDK, points out that the schools in the U.S. are good and getting better. They are critical to the future of the country and the public is increasingly understanding that fact. And he points to the fact that it is a relief that after a decade of psychic recession or cynicism about many of our public institutions things are beginning to change. He says that the U.S. public education system is a remarkably successful

institution. I concur. It is designed for every student and yet its very best students are as good as those of any in the world. It provides a high return on the dollars invested. And the future of America depends on investment in the development of human resources. Schools are obviously the best place to invest this resource and obtain the highest returns on that investment.

Here is my three-point summary of where we stand today. One, the public is demanding more than ever before and receiving more. Two, they are giving us less money to do it with. Three, they are criticizing us more for it. Demanding more, getting more, giving us less to do it with, and criticizing us more is a pretty "rum" situation. I think that an impartial judge from another planet would say that it is really not quite fair. And so as an educator, I think I share with a lot of you that sometimes we are a little angry, sometimes we are a little frustrated, sometimes we get a little mad. Maybe we get a little defensive. If so, I think it is not altogether unjustified. But my impression as I move around is that a lot of us are more burned <u>up</u> than burned <u>out</u> about the situation.

The public is demanding more and is going to continue to demand more. This will not change. The list of what they are demanding is long. And the key word is more--both in amount and in kinds. They want education from pre-school to community college; they want it close to home; and they want it cheap or free. They want each of their children taught according to their philosophy. They want the children to study the kinds of books whose points of view they agree with. They want the schools to fix each new problem: drugs, safety, sex equity, energy, metrics, morals, minorities, handicaps, etc. The list is long. In our recent research we found 58 different things that the federal government or the state government wants fixed. And at the same time we are supposed to spend more time on the basics. The public wants higher achievement, but they are not satisfied just to have students go through the schools. They want to give an independent test to be sure they have learned the material. And if they have not learned it, the questionable assumption is that it is the school's and the teacher's fault. The public wants every child treated individually but it wants them all to be treated equally. The handicapped children are to be mainstreamed and no discrimination of any group is permitted either overtly or covertly. And on top of all of these demands is the one that we must educate students in a way that is entertaining and immediately relevant.

Why these increased demands? There are at least three reasons. First, we have a long history of higher and higher expectations in this country of all of our institutions but particularly of our schools. And partly because of these higher and higher expectations we have been getting more and more. Secondly, we have a much better educated public. They are more literate, better organized, more active, and they have a better knowledge of what is going on in other parts of the world. They see on T.V. one week what is happening in a

Pennsylvania school and if it looks good they want it in their schools in California or Nevada. We are victims of our own success. And thirdly, there have been a series of societal changes of profound character. We have moved from a muscle to a machine to a knowledge society. We are moving from a monistic, scientific society to a pluralistic and humanistic one. All of these cause many problems and demands.

The demands will shift, but they will continue. We cannot expect them to decrease because the public schools and the private schools were formed in this country to meet the social demands of the country, and we will need to continue to try to meet them. Thus, we are caught in a cruel bind. We need more and better education than ever before both for the individual and society. But the resources are limited for a variety of reasons--not the least of which is there are other social demands as well. In a situation when higher expectations are not met, dissatisfactions are bound to arise even though things may be getting better. The only way that we as educators are going to meet the present demands is to become more efficient. This is not a word we like. We tend to shy away from it. But the inescapable fact is that we are going to have to get more results from the resources that we have.

Now let me turn to the heart of what I want to say to you, my topic of effective staff development. We have been working in California on a five-year longitudinal study of staff development in schools that began in 1979 and finished in 1983. Our sample includes seven counties, twenty school districts, and about 80 schools. The study was undertaken at the request of Dr. Alex Law, the Director of the Office of Program Evaluation and Research in the California State Department of Education, as the result of what the legislators, the public, and the many of his staff were saying about these current staff development programs. There were complaints that they were not working and that teachers did not like them. They called several of us together to ask if we could evaluate staff development, find out what was going right and what was going wrong. We began by looking at two things. First we studied all of the initiatives from state and federal sources and found that nobody in the State Department knew all of them or how they were related to one another. Once we sorted them out, we went to the schools to talk with the teachers, principals, superintendents, and students as to what was happening when those initiatives came down. And we found that it was not what was intended by those who handed them down.

Another conclusion was that in order to determine how staff development is operating and how it can be made to operate more effectively, we needed to take an in-depth approach. We proposed a three-to-five year study that would examine particular schools in-depth and talk with people over a period of time. We sent in our report and thought we would hear no more. It was only 20 pages, but it was a rather hard hitting report. To our surprise they said, "It sounds reasonable. Will you design and develop the instruments for

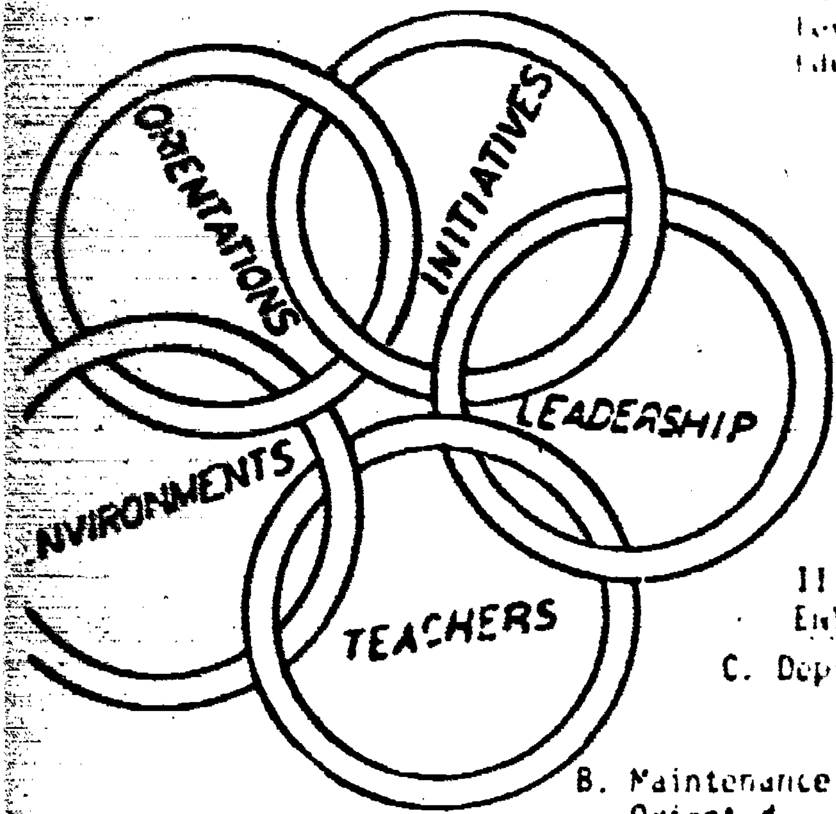
such a study?" We worked for a year with teachers and administrators and designed such a study with instrumentation. This time the report was 250 pages long. It said "If you want to conduct an effective study of staff development, here is the way to do it." Again to our surprise they said, "O.K., will you undertake a three-five year study and try to put these ideas into operation?" That is what we have been doing the last three years. We have made five reports, one for each year of the study. These are the data I am drawing upon as I speak to you today.

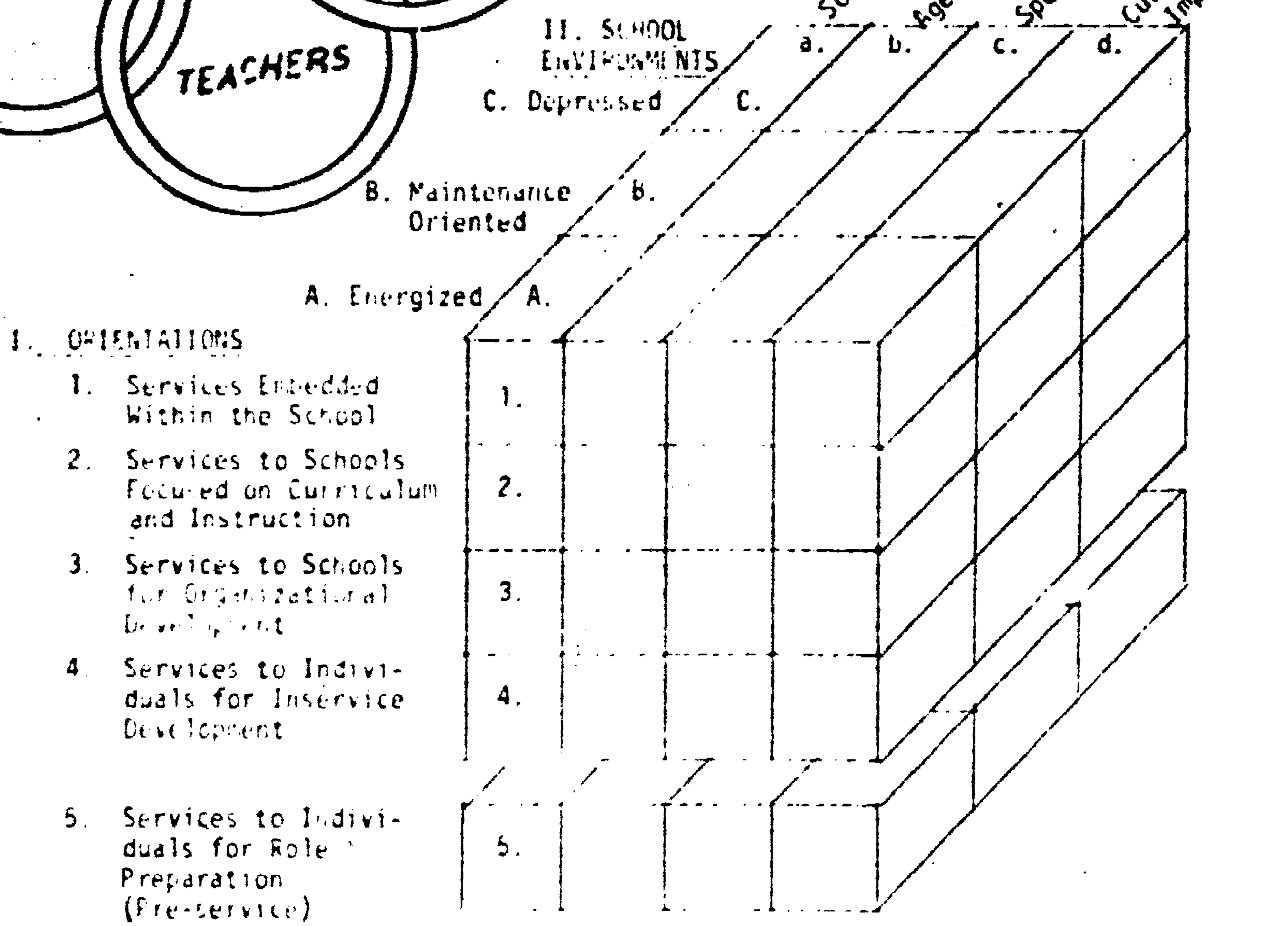
To optimize staff we first need to have well-trained teachers to begin with. Second, the local school workplace needs to become a growing, renewing, learning, problem-solving environment for everybody in it--not just for the kids, but also for the teachers and the principals as well. We find that they are not that way now. Some of them are and some educators do continue to improve themselves throughout their careers. However, it is unfortunately not the rule. Schools by and large are not self-renewing organizations. Too many of them are "tired." And the reason they are tired, I think, is because we are spending 99% of our time running the schools and not enough time observing what we are doing and taking time to think and to plan how we can improve. What I want to talk about is how we can change the character of the school workplace so that it becomes a self-renewing situation.

I want to concentrate on four things. Figure 1, with the little circles on it, will serve as an organizer of our thinking. I will cover numbers VI, I, III, Training, Orientations, and Initiatives; also number V, Teachers and number II, school environments. If I have any time left, I will talk a little bit about number IV, leadership, to add a few things to what Dr. Bossert covered earlier on this topic.

Let me start with training. We suggest five levels of training: (1) presentation of a theoretical and conceptual base; (2) modeling; (3) practice in controlled situations; (4) feedback; and (5) assistance and application. The objectives of training are conceptual control, skill and use. Let us suppose that one hundred of you went through the best possible presentation of the theoretical and conceptual base for a new procedure or something that you wanted to put into your in-service program. How many of you would go home and use it? We find from our experience and research results that about 10% would use it. Now suppose that it was also well modeled. It was demonstrated for you. You could see it done, either live or on videotape. How many do you think would use it? It increases it by about 2%-3%. Now suppose you have a chance to practice it, not in your regular classroom but in a controlled situation with a few students or with some of your colleagues. How many would go home and use it? It turns out to be only about another 2% to 3%. What happens if you get feedback on how well you have done it? Again only another 2 or 3%. But if you go to step 5 and somebody helps you in your class and in your school to adapt this, it goes up to about 95%!

FIGURE 1: [illegible]
(Dimensions Identified by Joyce, Bush and McKibbin in California Staff Development Study, State Department of Education, Sacramento, 1980)





IV. LEADERSHIP

- Principal as Manager
- Principal as Harmonizer
- Principal as Motivator

V. GROWTH STATES OF TEACHERS

- Omnivores
- Active Consumers
- Passive Consumers
- Retrenched
- Withdrawn

VI. TRAINING

- Levels of Training
- [illegible]

(Schematic prepared by Morgan Dale Lambert, March, 1983)

I. ORIENTATIONS	Examples
1. Services Embedded Within the School	Informal social support system (teacher-to-teacher, resource specialist).
2. Service to Schools Focused on Curriculum and Instruction	Clinical Supervision (teacher-to-teacher or with involvement of principal or consultant).
3. Services to Schools for Organizational Development	Consultants working to improve problem-solving/decision-making quality of the school environment.
4. Services to Individuals for Inservice Development	Training courses and workshops to individuals for role development.
5. Services to Individuals for Role Preparation (Pre-service)	Credit-bearing instruction to individuals for role preparation (credentials or degrees)

II. SCHOOL ENVIRONMENTS	
A. Energized	Staff feel motivated to work on professional development and program improvement.
B. Maintenance Oriented	Energy tends to be expended in maintaining program (little left for improvement and change).
C. Depressed	Environment seems to sap energy from people.

III. INITIATIVES	
a. School Based	AB 551 (Staff Development) AB 65 (SIP)
b. Agency Creating	Teacher Centers, Resource Centers, County Offices
c. Special Populations	Special Ed, Voc. Ed, Gifted & Talented
d. Curriculum Improvement	Bay Area Writing Project, California Math Project.

IV. LEADERSHIP	
Manager	Critical work activities (CWA) tend to be budgets, operational matters.
Harmonizer	CWA emphasize conflict resolution, problem-solving.
Motivator	CWA put emphasis on long-range planning, staff development, program improvement, change

V. GROWTH STATES OF TEACHERS	
Omnivores	Seek out or create opportunity for growth.
Active Consumers	Take some initiative in staff development.
Passive Consumers	Will participate but dependent on others.
Entrenched	Suspicious of innovation, resist change, use informal system to control and stifle.
Withdrawn	Push away activity options in formal system, rarely use informal interaction.

VI. TRAINING

A. Levels

1. Presentation of Theoretical and Conceptual Base
2. Modeling
3. Practice in Controlled Situations (Microteaching)
4. Feedback
5. On-hands Assistance in Application in Regular School/Classroom Setting (Coaching)

B. Objectives

1. Conceptual Control
2. Skill
3. Use (Transfer)

Unfortunately, most staff development is at level one and two. Sometimes it gets down to three not often to four or five. But you need to reach number five if you want a substantial number of people to use the training.

Let me now turn to some additional data from the Study. In California there is no well-established, smoothly flowing staff development system in place in most school systems. We are spending substantial and growing amounts of time and effort in staff development, school improvement, and in-service education, but they are not yet having a noticeable impact in most places. These matters are still considered to be something done to a teacher by somebody else. It is done to, not by, for, and with teacher. Further, the treatments are weak ones, even though powerful ones are available as the result of a decade of research and development. These stronger treatments do not for the most part reach our classrooms and affect the learner. Nonetheless, I am not pessimistic because we are finding that things are beginning to move in some places. We have found local schools and local school districts where energized environments have been created, where a group dynamic is present and a local problem-solving orientation to school improvement is operating with accelerating force, where there is a genuinely collaborative effort in place and all parties involved are working together to make that place better. Is it possible that the number of these places can become more widespread so that this will be the rule rather than the exception? My answer is unequivocally yes, it can be. So much for training.

Now let me turn to the next item in that list--teachers. We find in our studies that teachers are not all of the same cast. We have developed a five-fold category. At the top we have what we call the "Omnivores"; they consume everything in sight. (Remember we are thinking about staff development.) We have the "Active Consumers." They will actively consume what you give them. They will not insist that you give it to them, but they will consume it when it is given. Then we have "Passive Consumers". They will not look for it. They do not show a great appetite for it, but they will eat it. Then we have the "Withdrawn," and finally the "Entrenched," who have their feet firmly set. Now think of your school, or your situation. What percentage do you estimate are in those different categories? Now I will give you some figures so you can compare your estimates. We asked principals to estimate what percentage of their faculties they thought were in those categories. The principals said 29% of their teachers were Omnivores, 25% were Active Consumers, 30% were Passive Consumers, 10% were Withdrawn and 6% were Entrenched.

Here are the figures based on what we found in our case studies. We found 5% Omnivores, 20% Active Consumers, 50% Passive Consumers, 10% Withdrawn, and 15% Entrenched. Schools vary in the proportion of each. The balance that you have in your school affects what you can do with staff development in a significant way. That balance sets the tone of the school. Frequently, as staff development programs

are proposed, there is a tendency to think that teachers are all alike; we want them all to eat the same. Alas, they are not going to. Another question we have to raise is how malleable are these categories? Our present hypothesis is that the Omnivores and the Entrenched are probably the least malleable. Nonetheless, the Entrenched are important to deal with because a few Entrenched people in a school that does not have a strong staff development environment can effectively block staff development. They are the experienced people who for one reason or another say "no," and when they say no, if there is not a strong environment to the contrary, they can prevent much from going on. They can kill innovation. The Passive Consumers are probably the most malleable. Here is the largest number and the biggest area for action. These are some of the essential realities that we need to work against. Most staff development now offered is voluntary. We offer it and teachers are free to take it or to leave it. This draws mostly on category 1 and category 2, and they come back to the table time after time. So we touch the five percent and the twenty percent and miss 75% by our voluntary programs.

This is an important policy issue for a school, for a district and for the state. How much shall be required and how much shall be voluntary? Another big policy and strategic question is how to reach the 75% that are not reached by the traditional programs as now set forth?

What about the amount of training that we provide? Our facts show that overall it is very little, and even less that has the "hands on" part included. We found the average days of staff development for teachers to be 3.82. It ranged from none up to 9 or 10; in no instance did it go beyond that. For principals, the average was 7.5. They are doing twice as much as the teachers, but neither one of them is doing very much when it comes to what you need to do in order to get new practices developed and translated into action in the schools.

Here are a few added facts. Teachers say that they get the most and best help on their curriculum and teaching problems from other teachers, most of this being done informally. But we also find that teachers do not frequently visit each other's classes, make records of what they see, and talk about it to each other systematically. We find that teachers on the average spend only one or two days per year engaging in that activity. Why does this appalling condition exist in our schools? We find three reasons. First, teachers feel uncomfortable. We have not been socialized to do this. Part of this results from the way we train teachers, but more importantly it is how we treat beginning teachers during the first few years of their profession when they are being socialized. This can be changed. I think it is important for you to think about how it can be changed in your situation.

The second reason they do not observe and visit each other is that there is no time for it. Teachers have very little free time with paid substitutes. This is changing, but slowly, for it takes a change in attitude on the part of principals, teachers, and parents. What happens when you have a substitute and go somewhere else? The teacher says, "I cannot leave those poor kids. Think what will happen to them without me?" And the parents say, "I do not want the regular teacher away from the classroom." And the research says, "You have to have more on-task time." I am suggesting we need to re-think how we spend our time. It might be better to alter some of our existing behavior and attitudes if we are going to achieve increased power in staff development.

The third reason that classroom visits are not more regular amongst teachers is that they have traditionally been reserved for rating, tenure and for people in trouble. They are done by administrators for those purposes rather than for the improvement of instruction. All of these feelings are deeply ingrained, but they can be changed. If they are not, the individual teacher fails to get a perspective of what he or she is doing and does not come to appreciate some of the things that are done well and will not be disposed then to share those excellent things with other teachers. There is a tradition against that. But when these conditions begin to break down, things begin to change rather rapidly.

Since time is running out, let me turn to the last two points--the environment and leadership. Schools have either an energizing environment, a maintenance-oriented environment or a depressant environment. The aim is to move to an energized environment if you do not already have one. How many schools do you think are energized, how many are maintenance-oriented and how many are depressant? Again write down your estimates on Figure 1. Our data are not as firm here because we are just beginning to get this material together. Here our tentative figures for the California schools that we have been working with. About 10% of them are energized. This is about the same as the percentage of people who will go away from this meeting and apply what we say, the Omnivores. About 75% are maintenance-oriented and about 15% are depressant. These latter say, "There is so much energy needed to keep the place together that there is not really much time left to be spent in improvement."

Now just a word about leadership. Middle management may be the most crucial management in the schools. Sorry, Mr. Superintendent. We find three types of roles being performed: the Manager, the Harmonizer, and the Motivator. The Manager functions (1) to operate the school according to the established policies of the district, seeing that those policies are communicated and translated into action, and (2) to take care of the million details that have to be taken care of if a school is not going to run amuck and is to operate at all.

Secondly, the principal is expected to make everybody happy about the operation of the school--the teachers, the kids, the parents. This is the harmonizing role. And then on top of this, the principal is supposed to improve the school all of the time--which means upsetting the equilibrium just when it has been re-established. Everybody is admonishing you, the principal, to take on the number three role--the Motivator. But a look at our figures shows that most principals spend most of their time in number one, managing. The next largest amount of time is devoted to number two. The least amount is number three. Our personal experience is that this has been true for forty or fifty years. That is as far back as I go personally, but the historical literature says it was true before that. Now, the interesting question is why? I am sorry that I do not have the time to go into it, except to assure you that it is not because the principal is stubborn, does not want to or is not very bright. There are good strong historical reasons as to why this condition is true. It is the nature of the middle management task to perform the managerial things or the school does not keep running. It is the result of the policies of the school district, the expectations of the people from the board of education and the central office. It is because of the rewards and the necessities. When this function is performed, there is not much time left over. What can be done about this? I wish we could have a discussion of that. Unfortunately I am afraid that most of what we have been saying in terms of staff development leadership for principals is really not very realistic.

Table 1 lists five alternatives for action. At the moment, it looks to us as though number four and number five have better chances than the others for seeing that the motivational role is more adequately taken care of. We have talked a lot about giving teachers help, and I think that is important because they too are spending most of their time doing numbers one and two. But principals need help also.

Let me conclude by summing up the question of how can we continue to improve and grow in our career? I would say that attracting an able cadre of personnel for the profession is going to depend upon our answer to this question. If we attract able personnel to teaching, train them well initially, have an effective staff development program, and add adequate economic reward and high public esteem, then I think we will be well on our way.

We must continue to build upon our knowledge base but we are not using the existing knowledge base nearly to the extent that it can be used. We need to continue to improve that base because it is far from where it should be. We need also to develop a master plan at the state level for in-service and pre-service education. We need a master plan as no one group or person can do it alone. The federal government has to participate. The state government has a crucial role as does the legislature and the local district and the school. Failure at any point in that chain can prevent other parts from

operating. It is a system. We need to work at all levels. But the most fundamental action is at the local school where the teacher, the principal, the parents, and the kids are working. That's the most fundamental place to begin.

Table 2 lists eleven practical questions that you can ask yourselves in your own local schools to determine where you are, and where you might most want to begin work. Let me just close with mentioning one of them as an example--all of them are important to me and you can no doubt formulate your own better list. Is there time in the regular schedule of the school when teachers are free from direct instruction of students for them to engage in activities designed to improve their teaching? Is there time when they can visit, record the results and talk about them? Are funds available for teachers to do this frequently and on regular time rather than having it done at their own expense, after school, weekends, or vacations--on what I call "tired time?"

I think the time is ripe for important change. We are ready to move. I think there is an impetus I would agree with the governor that there is no need to be defensive. We have much work to do. We can begin tomorrow. We do not have to wait for the legislature. We need some more money which will help. But we can begin tomorrow. Indeed I am sure most of us have already begun. It is a matter of taking the next step that would be best for all of us.

TABLE I

CALIFORNIA STAFF DEVELOPMENT STUDY

Five Alternative Strategies for Strengthening the Educational Leadership of Principals

1. Alter substantially the initial training, selection, and the inservice education of school principals.

2. Change the requirements for the principal to have them all provide direct services (staff development, training, supervision) to teachers on a regular basis.

3. Work to obtain added specialized staff who are assigned to the school or can be brought in periodically to provide direct services (e.g., specialists in specific fields as: psychology, evaluation, special education, bilingual, immigrant, curriculum--saturate the school with categorical dollars and people).

4. Have the principal take an active role in creating a school improvement, problem-solving environment in the school.

5. Work at changing central administration and board policies which give greater prominence to educational leadership responsibilities. Augment substantially district school improvement policies and budgets.

For each of these we present a brief discussion of the (1) line of argument advanced by those who advocate the various strategies, (2) the actions necessary to carry out the strategies, and (3) the likely outcomes of following them.

TABLE 2

Illustrative Questions a School/Community Can Ask to Judge Its Staff Development Program

by Robert N. Bush
Stanford University, February 1984

1. Is there time in the regular daily and weekly schedule of the school when the teachers are free from direct instruction of students for them to engage in activities designed to improve their teaching?

OR

Is there no such time and do teachers, administrators and parents resist any efforts that take teachers away from their students for any reason?

2. Do teachers visit, observe other teachers (in their own and other schools) systematically, make records of such, and engage in active dialog with other teachers about the results?

OR

Do they operate mostly alone, behind high walls and closed doors in their classroom castles?

3. Do teachers welcome others into their rooms for observation and discussion of curriculum, instruction and are they willing to engage in demonstrations of things they can do well for other teachers?

OR

Do they hide behind false modesty, traditional taboos, and keep their classroom secrets to themselves?

4. Are funds available for teachers to attend workshops, training sessions on topics of interest and importance to them frequently and on regualr school time?

OR

Do they have to do these things mainly on their own time and at their own expense, after school, weekends, vacations or on TIRED TIME?

4.1 And when they do attend such sessions, is followup assistance, "hands-on" help porvided to enable them to adapt, transfet and integrate the new ideas into their regular teaching practice?

OR

Does the new idea, after its initial stimulation, die aborning and fail to get into regular use in the classroom?

5. Do principals spend a substantial amount of their time talking to and working with teachers, visiting their classrooms, helping them to obtain materials and facilitating their efforts at improvement in a non-treatening, non-evaluative way?

OR

Do they spend most of their time on routines of managerial details and public relations matters?

6. Is the school well supplied with teachers' aides and other types of instructional assistants?

OR

Is the teacher left alone to handle all of the routines of teaching?

7. Is the typical picture in a school one in which many parents and other citizens frequent the school and participate actively in school activities?

OR

Are parents and others called to school manily when there is trouble and on special days or evenings once or twice a year?

8 Do teachers, administrators, parents and other citizens have frequent opportunity to discuss in a free and non-adversarial manner not only the education of particular children but matters of curriculum and instruction and other vital school matters?

OR

Is this type of dialog limited or almost non-existent or confined to when there is a big problem?

9. Is there a regular budget of hard local dollars devoted to staff development, inservice education and school improvement that is governed at the grass roots level?

OR

Are such efforts mainly supported by soft, external dollars from state and federal, private sources and soley under strict administrative control?

10. Does the local school, district and board of education have a written, formally adopted policy with regard to staff development, inservice education, and school improvement behind which it has regular budget funds that are not the first to be swept away when there is some financial pinch?

OR

Is the answer to this question "no"?

"Our basic staffing policy is to recruit the best people that we can find and put them into real jobs where they have a chance to make an immediate contribution."

"We discovered that higher quality actually costs less. One division estimated that if it did everything right the first time, and on time, it could get by with one-third fewer people, one-fourth less space, and two-thirds less inventory."

MANAGEMENT DEVELOPMENT AT HEWLETT-PACKARD

William P. Nilsson
Manager, Corporate Training and Development
Hewlett-Packard Company

I am delighted to have this opportunity to be a part of this Conference for California educators and share with you the approach we take in developing our managers at Hewlett-Packard. In addition I would like to outline some things we are doing at HP to enhance our overall organizational effectiveness.

As a framework for my remarks, I would like to give you a few facts about our company. Hewlett-Packard produces computers, electronic instruments and systems, medical instrumentation, analytical instruments, and specialized electronic components. Orders this year will approximate $5 billion and worldwide employment is about 72,000. We have about 60 product divisions organized into 5 product groups with factories in the United States, Europe, Asia, and Latin America.

Management development at HP starts with an emphasis on our overall working environment. Starting with some basic ideas of our founders, Bill Hewlett and Dave Packard, on how a company should be managed, a very unique company culture has evolved at HP. This culture, referred to throughout the company as "The HP Way", continues to flourish. New employees learn about the HP Way soon after joining the company through locally conducted new employee orientation programs. The company's basic values, our statement of Corporate Objectives, are described to each employee (Table I). They are given a booklet outlining the objectives in detail, and the objectives are revisited in nearly every training program we run, even in our most senior management development course for corporate executives.

The positive working environment was greatly enhanced by an early decision to organize the company into relatively independent product divisions, each operating as a small business with its own functional management and product charter. This has kept for us a small company atmosphere that encourages entrepreneurship and innovation.

Our basic staffing policy is to recruit the best people that we can find and put them into real jobs where they have a chance to make an immediate contribution. For example, new engineers are assigned to a new product development team, and new MBA's recruited into marketing go on the road to talk to real customers. New people are given an opportunity to learn by making mistakes, and all employees are encouraged to stick their necks out. Lessons learned by making mistakes are usually retained. To foster creativity we allow unusual individual autonomy and challenge people by keeping decision making

and responsibility at the lowest possible level. We encourage informality with the use of first names, shirt-sleeve management, open offices, informal communication across organizational lines, and flexible working hours. Sixty-four percent of our employees participate in our stock purchase program, and all employees share in the company's profits.

At Hewlett-Packard we promote from within the company. This makes opportunities for advancement real to our people and also stimulates training and development at all levels. If you are required to promote someone from within to fill a management opening, you are much more apt to be willing to spend time, effort, and money on continuing development of your employees. Managers learn early in their careers that their only source of success is their people, so if they want to be more successful, they should work on those things that will make their people more successful.

We think a good test of the working environment is whether the organization has been successful in getting people working together toward common goals. Managers at all levels are evaluated and promoted on their ability to engender teamwork. We encourage managers to "manage by wandering around" as it is difficult to lead if you are not out with your people. I have never seen a manager at HP fail who was the leader of a successful team!

Like many U.S. companies we have implemented quality circles at HP where we call them Quality Teams. We have about 1,000 teams in place worldwide in our manufacturing and sales entities, and feel that they are natural extensions of the HP way. We hope to fully integrate the Quality Team process into our regular management function during the next few years.

A major objective for our corporate training and development activity is the perpetuation of our management style and working environment, and management training is very fundamental to this perpetuation effort. Although I will not spend appreciable time describing our management development programs, I did want to share with you our basic strategy. This strategy is based on four levels of management transition (Table 2). The major developmental needs of the newly promoted manager at each level have been identified, and management development courses and seminars have been developed for each transition. A common characteristic of the curriculum is the teaching of those principles and practices that have proven successful at Hewlett-Packard as well as a strong emphasis on the implementation of the Corporate Objectives. The overall strategy focuses on the "blocking and tackling" of management development, and implementation is at the local level in all cases except for seminars in functional and general management.

The first level of supervision has a significant amount of influence on the working environment of an organization, and for this reason, we pay close attention to the development of new managers. A

management development program consisting of a series of modules on essential management topics is taught in each of our entities using local instructors, most of whom are line managers. The corporate developed curriculum emphasizes Hewlett-Packard management philosophy, as a prime objective of the program is the perpetuation of the HP Way. As the most successful managers develop their skills on the job working for a manager who is a good coach, we recently developed and implemented a program, "Managing Managers," to provide new managers of first level managers an opportunity to develop skills in leadership, coaching, team building, managing differences, and working with their boss. The basic content of our programs for first and second level managers is shown in Table 3.

Becoming a functional manager at HP is perhaps the most difficult transition. Managers promoted to this level normally have spent their entire career in one function, frequently engineering, marketing, or manufacturing, and have only limited knowledge of other functional areas. As a functional manager, they join the senior management team of a division or sales entity, and their success depends heavily on how familiar they are with the management of other functions.

The "Management Seminar" is a week long program, normally held in Palo Alto, that provides intensive coverage of management concerns of all functions as well as tutorial sessions in accounting and finance. Instructors are experienced HP general and functional managers supplemented with faculty from graduate schools of business. An HP developed computer simulation exercise provides each attendee an opportunity during the week to "manage" a function other than his own as part of a seven person management team.

The transition to general management requires that the manager develop skills critical to leading a team of functional managers responsible for a 500 to 2000 person division or sales entity. The basic needs for this transition are met by the "Executive Seminar." The curriculum emphasizes strategic management, financial analysis, product strategy, financial control and measurement systems, economics, general management, and organizational behavior. The faculty is balanced between HP executives and graduate business school faculty.

An "Advanced Management Program" was designed in 1979 for senior general managers and corporate executives. This program develops skills in long term strategic thinking. Attendees develop likely scenarios for the next decade as well as a strategy for optimizing the company's success in these scenarios. Faculty is drawn from leading graduate schools of business.

I would like to comment now on some management development activities in our company that are specifically directed at making a significant improvement in overall effectiveness and productivity.

Although we have had a tradition of quality workmanship since our founding, several years ago we began to recognize that we could gain an important competitive advantage if we could make even greater improvements in our product quality and production costs. After some studies in some of our divisions, we discovered that higher quality actually costs less. One division estimated that if it did everything right the first time, and on time, it could get by with one-third fewer people, one-fourth less space, and two-thirds less inventory. Many of our senior functional managers attended various training courses and seminars on productivity and quality methods, and this activity certainly made some contribution to our efforts. We recognized, however, that many of our divisions were well ahead of the state of the art in many of these areas, and our corporate training and development organization was encouraged to figure out a way that these "best practices" in our company could be identified, documented, and passed on to every division on a worldwide basis. The result was the development of a Manufacturing Management Seminar that has now been implemented throughout Hewlett-Packard. I think that it is important to note that this program has gone way beyond the training of our manufacturing managers and the interchange of "best practices." It also gave top management an opportunity to set expectations for the manufacturing function. An outline of this program is shown in Table 4. Each session was developed by HP managers who excelled in a particular phase of manufacturing management. In a few cases, graduate business school faculty were used to supplement the HP developed material. Much of the content was videotaped in our corporate TV studios for consistency in presentation, as the program was implemented locally in each division.

The final example that I would like to use this morning is a program for enhancing R&D productivity. R&D productivity is absolutely critical to our company's success. The first part of our R&D productivity effort is a training program for R&D project managers that was recently developed and introduced worldwide. The course was developed internally using our very best R&D managers to develop the curriculum, much of it based on "best practices" in our divisions. An outline is shown in Table 5. Like the manufacturing management seminar, a major part of the program is videotape-based to insure consistency. Setting management expectations through this focused training program on R&D management was also an objective of the seminar, and it was introduced to our divisions via a live teleconference originating from our Palo Alto headquarters. Although we had previously used live telecasts for product training of our sales and support people and for new product press conferences, this was the first time that we had used this medium for management development. Our president and other members of our top management team were able to communicate their expectations to all of our engineering managers in our remotely scattered divisions simultaneously. The seminar content was described in detail by the people who developed the program, and our divisions were told how to get the program started.

The second component of our R&D productivity program is the continuing education of engineers and computer scientists, and although we have had a formal program since the early 1950's, it has recently assumed an even more important role in our R&D productivity efforts. I am sure you are all aware of the serious engineering shortage that our country faces. The American Electronics Association recently projected the need for the U.S. to triple the output of new electrical engineers and computer scientists within the next five years to meet the growth objectives of the electronics industry. Even if this estimate is on the high side, those of us in high technology industries will really have to scramble to meet our needs for technical people. This problem could be lessened if we can figure out some ways to make more productive use of the engineers and computer scientists that we already have. Continuing education, particularly keeping technical professionals current in their technology, provides tremendous leverage in R&D productivity.

Unfortunately, due to rapid changes in technology, the so-called "half life" of an engineer is estimated to be somewhere between 3 and 5 years. For these people to just stay up-to-date, it suggests that they would need, over a 40 year career, to be reeducated 8 times! Moreover, recent graduates are not able to master the required knowledge during the standard four year curriculum, and much of their education requires deferral to their working life. We are expanding our efforts in the continuing education area. We currently have over 400 engineers and computer scientists taking graduate level courses at Stanford University, and additional programs in other universities help us meet this critical educational need. The continuing education of working engineers and other professionals should be a major objective for training and development in the years ahead.

TABLE 1

THE HEWLETT-PACKARD OBJECTIVES

1. PROFIT

   To achieve sufficient profit to finance our company growth and to provide the resources we need to achieve our other corporate objectives.

2. CUSTOMERS

   To provide products and services of the highest quality and the greatest possible value to our customers, thereby gaining and holding their respect and loyalty.

3. FIELDS OF INTEREST

   To build on our strengths in the company's traditional fields of interest, and to enter new fields only when it is consistent with the basic purpose of our business and when we can assure ourselves of making a needed and profitable contribution to the field.

4. GROWTH

   To let our growth be limited only by our profits and our ability to develop and produce innovative products that satisfy real customer needs.

5. OUR PEOPLE

   To help HP people share in the company's success which they make possible; to provide job security based on their performance; to insure them a safe and pleasant work environment; to recognize their individual achievements; and to help them gain a sense of satisfaction and accomplishment from their work.

6. MANAGEMENT

   To foster initiative and creativity by allowing the individual great freedom of action in attaining well-defined objectives.

7. CITIZENSHIP

   To honor our obligations to society by being an economic, intellectual, and social asset to each nation and each community in which we operate.

TABLE 2

HEWLETT-PACKARD COMPANY BASIC TRAINING PROGRAMS

TRANSITION	PROGRAMS
TO GENERAL MANAGER	EXECUTIVE SEMINAR
TO FUNCTIONAL MANAGER	MANAGEMENT SEMINAR
TO MANAGER OF MANAGERS	MANAGING MANAGERS
TO MANAGER	MANAGEMENT DEVELOPMENT PROGRAM INTRODUCTION TO MANAGEMENT
NON MANAGERS	WORKING AT HP NEW EMPLOYEE ORIENTATION

TABLE 3

BASIC MANAGEMENT DEVELOPMENT

PROGRAM	ATTENDEES	CURRICULUM EMPHASIS
INTRODUCTION TO MANAGEMENT (SELF-PACED)	NEW MANAGERS	ROLE OF THE MANAGER MANAGING THE HP WAY COMMUNICATING WITH PEOPLE ADMINISTRATIVE TASKS PERFORMANCE EVALUATION AND SALARY ADMINISTRATION
MANAGEMENT DEVELOPMENT PROGRAM	NEW MANAGERS	MANAGING AT HP (MANAGEMENT BY OBJECTIVES) PERFORMANCE EVALUATION AND DEVELOPMENT SALARY ADMINISTRATION AFFIRMATIVE ACTION SELECTION AND INTERVIEWING LEADERSHIP
MANAGING MANAGERS	MANAGERS OF MANAGERS	LEADERSHIP SKILLS COACHING TEAMBUILDING MANAGING DIFFERENCES WORKING WITH YOUR BOSS EFFECTIVE MEETINGS

TABLE 4

HEWLETT-PACKARD COMPANY
MANUFACTURING MANAGEMENT SEMINAR

BUSINESS STRATEGY	MANAGING MANUFACTURING COSTS
MANUFACTURING STRATEGY	MATERIALS MANAGEMENT
NEW PRODUCT DEVELOPMENT	INFORMATION SYSTEMS
MARKETING	AUTOMATION
QUALITY/PRODUCTIVITY	LONG RANGE CAPACITY PLANNING
ASSET UTILIZATION	

TABLE 5

HEWLETT-PACKARD COMPANY
R & D PROJECT MANAGEMENT SEMINAR

ROLE OF R & D PROJECT MANAGERS AT HP	FINANCE
STRATEGY	MANUFACTURING
PROJECT LIFE CYCLE	QUALITY ASSURANCE
PLANNING AND CONTROLLING	INTERFUNCTIONAL PROBLEM SOLVING
MANAGING MEMBERS OF TECHNICAL STAFF	EFFECTIVE MEETINGS
MARKETING	PRODUCTIVITY

"The development of school norms which support the continuous study and improvement of teaching builds capability for any kind of change, whether it be adoption of a new curriculum, school-wide discipline policies, or the building of teaching repertoires."

"Teachers have so long worked in isolation that serious distortions have often developed about personal competence. Principals must work to establish new norms that reward collegial planning, public teaching, constructive feedback, and experimentation."

"The knowledge about effective training combined with new understanding of the organizational requirements for change places us in a favorable position to attack educational problems and have some hope for effective solutions."

SCHOOL IMPROVEMENT THROUGH STAFF DEVELOPMENT:
THE COACHING OF TEACHING

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This paper rests on two propositions. First, that inservice training must be radically changed in order to result in the transfer of training to classroom practice; and second, that inservice training must be embedded in coherent school improvement systems in order for change to be sustained.

Research on training has demonstrated that with thorough training, which includes theory, demonstration, opportunities for practice and feedback, most teachers can acquire skills and strategies previously absent from their teaching repertoires (Joyce & Showers, 1982, in press). Unfortunately, that same literature suggests a failure to transfer new knowledge and skills to classroom practice, or, if initial transfer was accomplished, a rapid attrition of new behaviors over time (Fullan, 1982). In addition, if the object of training was addition to teachers' repertoire of skills and strategies radically different from their normal teaching styles, as contrasted with fine tuning of existing behaviors, transfer was unlikely to occur at all (Joyce & Showers, in press; Showers, 1982). Teacher trainers have for so long assumed that transfer would occur once skills were mastered that we have had to rely, for the most part, on researchers who study the change process to discover that much of our training has disappeared at the point we most care about--the interaction between teachers and students.

Training Studies

Concern for the transfer of training has motivated a series of training studies designed to build understanding of the problems of transfer, increase rates of transfer of training, and determine the extent of attrition er time when training was boosted by the coaching of teaching.

The Coaching of Teaching

The first study (Showers, 1982) trained 17 junior high teachers of language arts and social studies in three models of teaching which represented new repertoires for the subjects. All teachers were trained together for eight weeks (three hours per week) in a setting which included theory presentations, demonstrations of the new strategies, peer teaching sessions with feedback from peers and

trainers, and practice with students in their own classrooms. At the close of this initial training period, all teachers were administered a conceptual level test (Hunt et al., 1978), and were interviewed regarding their attitudes toward the training and their perceptions of the usefulness of the newly-learned strategies. Teachers were then blocked on conceptual level and randomly assigned to either a coached or uncoached treatment condition for the next seven weeks. During the treatment period, all teachers were encouraged to use the new strategies and were observed in their classrooms regularly. At the end of the treatment period, all teachers performed a transfer task in which they taught the same unit of material to one class of students.

Transfer of training scores was computed for the project teachers based on their skill with the strategies, the appropriateness with which they used the new models of teaching in their classrooms, the degree to which they were able to teach their students to operate comfortably and efficiently with the strategies, and the frequency with which they employed the strategies during the treatment period and the transfer task. The maximum possible transfer score was 18.

The mean transfer score for coached teachers at the end of training was 11.67 and for uncoached teachers 5.75. Conceptual level operated as predicted only for the coached teachers (see Table 1). Interaction of the coaching treatment with conceptual level indicated that high CL teachers who were coached transferred training at a much greater rate than did low CL coached teachers, but uncoached teachers transferred training at a very low rate regardless of their conceptual level.

TABLE 1

Mean Transfer Scores for Coached and Uncoached Teachers By Conceptual Level

		Coached	Uncoached
CL	HI	13.6	5.5
	LO	9.2	6.0

Interestingly, at the end of initial training and again at the end of the treatment period all teachers from both groups reported positive attitudes toward training as well as intentions to use the new strategies in their classroom instruction. Those teachers who had not used the strategies during the previous 10 weeks nevertheless

felt that during their summer break they would incorporate the new models of teaching into their instructional plans for the coming school year.

This first coaching study also yielc i information on the difficulties experienced by teachers as they attempted to transfer complex new teaching strategies into their instructional repertoires. Teachers reported concerns with additional time required for new and, at first, more awkward teaching techniques, anxieties regarding possible management problems resulting from teaching strategies that elicited different sets of pupil behaviors, and fears that their experimental behavior would not be supported by administrators. The most serious problem, however, lay in finding appropriate occasions for use of the new strategies. Teachers who had typically relied on curricular materials provided by their state or district for organizing courses found it difficult to reorganize material in ways suitable for the new strategies. For example, teachers using a social studies text organized by countries found it difficult to draw from their subject/curriculum four or five underlying concepts the mastery of which would enable students to examine similarities/differences across cultures. Or teachers using English texts that emphasized structural analysis of the language were puzzled about the appropriate scheduling of strategies that focused on writing skills.

The power of coaching in attacking transfer problems was apparent in our final results. Teachers who were not coached practiced the new strategies less and therefore developed less technical skill in the use of the models. Because uncoached teachers practiced les their students had less opportunity to master new sets of resp s required by specific strategies, and therefore, their teache ver reached a level of comfort with the strategies that might h ncouraged further use. Uncoached teachers who did continue to p ce occasionally but without the analysis and feedback prov by coaching did not, for the most part, develop greater skill . he strategies. As learning psychologists have taught us, practice without feedback tends to make us more and more proficient in our mistakes.

Coaching in this study was provided by a single consultant who observed each teacher in the coaching sample once a week and then conferred with that teacher to provide feedback, support and encouragement, assistance in planning future lessons, and occasionally, to help with the location and production of materials.

Long-Term Effects of Coaching

A second study followed up our first set of teachers six to nine months after the close of the first project to determine if skills and transfer of training were retained (Baker, 1983). We were also curious to discover if, as in the Sharan & Hertz-Lazarowitz Study (1982), there might exist a "lag" effect whereby teachers improved

the skill and appropriateness with which they used complex new strategies after a summer break.

Baker asked teachers in the Showers' sample from the previous year to demonstrate lessons with the strategies learned and to be interviewed. Several results are noteworthy here. First, coached teachers maintained their advantage in both skill and transfer six to nine months after training (see Table 2). Second, transfer scores increased for both coached and uncoached groups of teachers during this period. Although teachers reported that they were no more proficient with the strategies than they had been at the close of the previous school year, their actual transfer scores provided some support for a "lag" effect following strong training. Finally, several of the uncoached teachers found they were unable to demonstrate the models at all following a several months-long hiatus in practice with the strategies. While this had the effect of artificially inflating the transfer scores of the remaining uncoached teachers, a significant difference still existed between the two groups.

TABLE 2

Persistence of Training Effects

	Coached	Uncoached
Skill	4.0	2.9
Transfer	15.25	10.7

Peer Coaching

A second study by Showers (1983, in press) investigated the effects of peer coaching on teachers' ability to transfer new models of teaching into their instructional repertoires. Specifically, the study sought to discover if peer coaches could be trained to provide consistent coaching to a new group of trainees and if a peer coaching treatment would replicate earlier effects of coaching. Furthermore, we hoped to determine the degree of teacher collegiality developed by a peer-coaching approach to training. Little (1982) reported that schools with norms of "learning on the job" and continuous improvement were characterized by high degrees of teacher collegiality.

Six peer coaches (drawn from teachers who participated in the first Showers' study) each coached two to three teachers following an

initial six-week training period for 19 teachers in two models of teaching (n=13 coached teachers and 5 uncoached teachers). Peer coaches observed each of their trainees one period per week and met with them following the observation for the coaching sessions. Specifics of the coaching treatment were modeled after the procedures developed by Showers in her 1982 study. Trainees were assigned to peer coaches on purely logistical grounds (e.g., teachers' choice of class to work with, placement of preparation periods, and in some cases, distances between schools).

At the end of the project, the mean transfer score for peer-coached teachers was 12.00 (S.D. = 2.10) and for uncoached teachers the mean transfer score was 9.5 (S.D. = 1.27). Furthermore, coached teachers reported unanimously that the peer coaching had been a positive experience both professionally and interpersonally. Given that several trainees had expressed concern at the start of peer coaching regarding their particular peer coach, we were relieved to discover that the coaching experience had remained consistently at a highly professional level, despite several previous conflict situations.

Staff Development and School Improvement

The role of staff development in school improvement appears to be of critical importance. Whatever the content of inservice training, if it represents an addition to repertoire for participating teachers, training will need to be considerably more intensive than is normally the case if new behaviors are to be integrated into classroom practice. The provision of coaching following initial training, even very strong training, apparently is essential for most teachers if new skills and strategies are to be appropriately implemented.

Implementation of a peer coaching program in a school has effects much more far reaching than the mastery and integration of new knowledge and skills for individual teachers. The development of school norms which support the continuous study and improvement of teaching builds capability for any kind of change, whether it be adoption of a new curriculum, school-wide discipline policies, or the building of teaching repertoire. By building permanent structures for collegial relationships, schools can organize themselves for improvement in whatever area they choose. The studies reported here have demonstrated both the necessity for fully elaborated training systems (as contrasted with the more common one-shot inservice offerings) and the viability of peer-coaching relationships.

Implications for Leadership

The design and implementation of powerful training systems is unlikely to occur without thoughtful and determined leadership at

both the district and building levels. Administrators will have to carefully examine priorities for staff development and the allocation of funds to staff development activities. Whatever the size of a district/school staff development budget, few budgets can sustain both intensive, focused training and numerous one-shot activities at a very high level of funding. Decisions must be made regarding the outcomes expected of staff development programs. When the desired outcome is simply increased awareness of a subject, funding might legitimately support the occasional two-hour speaker. When, however, the expected outcome of staff development is change in the instruction students receive, funding will probable have to be focused more narrowly in order to support the magnitude of training necessary to bring about that change.

Organization of peer-coaching systems will most likely need to be cooperatively arranged between district administrators and school sites. In schools where teachers already have preparation periods scheduled into their work days, teachers can be organized into coaching teams for collaborative planning and feedback sessions. Some schools have used specialist teachers to release teachers for observation periods, and some principals have taken classes in order to provide observation times for teachers. In other cases, teachers have had to videotape lessons for sharing at a later time when live observations could not be arranged. In the peer coaching study reported here, substitutes were provided for peer coaches one day per week in order for them to complete their observations and conferences. Creative problem-solving by teachers and administrators will almost surely result in solutions to the time demands of the continuous study and analysis of teaching. Without the active support and involvement of building principals, however, few teachers will be able to establish such systems for themselves.

Principals must do more than assist with the logistics of peer coaching systems if they are to become institutionalized. Teachers have so long worked in isolation that serious distortions have often developed about personal competence. Principals must work to establish new norms that reward collegial planning, public teaching, constructive feedback, and experimentation. Professional growth must be seen as a valuable and expected process and clearly separated from the evaluation of performance.

Not only are principals in a unique position to influence building norms, they are also perfectly situated to facilitate the implementation of peer-coaching systems through collaborative problem-solving with their teachers. Flexible scheduling for training, observation, feedback and planning can be uniquely planned to meet the needs of individual faculties. Available rewards and incentives can be brought to bear to encourage developing norms of collegiality. Parents and community members' support can be solicited by explaining the purpose and expected outcomes of intensive staff development programs embedded in larger school

improvement efforts. And principals must initiate these activities if they are to have any hope of affecting entire schools.

Finally, principals can use their influence to ensure that quality inservice programs are provided for teachers. Coaching programs must have some content to coach, and the greater the expertise brought to bear on identified problems, the greater the dividends from a coaching effort.

We understand more about the change process today than at any time in the past 50 years. The knowledge about effective training combined with new understanding of the organizational requirements for change places us in a favorable position to attack educational problems and have some hope for effective solutions. All those involved in the educational endeavor have important roles to perform if we are to succeed in creating excellent schools. The knowledge base exists to guide our efforts. Let us begin.

"In every school there are teachers who have the interest and ability to share their well-developed expertise with their peers. Too often because of time constraints and past practice, their talents were not tapped. The Instructional Support Team provides a vehicle for developing and using staff expertise."

"The Instructional Support Teams may advise the principal and assist in the planning and implementing of any activities which affect the school. Principals express enormous enthusiasm for having a group of teachers to provide staff input and help in decision making."

IMPROVING INSTRUCTION WITH SCHOOL-SITE SUPPORT TEAMS

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A great deal of the literature on school improvement and instructional improvement focuses on the leadership abilities of the principal and on the components of effective classroom instruction. The Teacher Center movement focused attention on the importance of peer support among teachers. There is currently legislation and a great deal of interest in the concept of mentor teachers. The Vallejo Professional Development Center has tried to combine the best of both worlds by developing a program to train Instructional Support Teams composed of principals and teachers from each school in the district to promote instructional improvement at their own sites. This paper is a description of that effort.

This paper will describe the program that began in September 1981 and is currently being implemented to use Instructional Support Teams in the Vallejo School District. First, background information will be given to provide a contextual description of the school district setting, the recent history of staff development programs in the district, and the entire district staff development program. This will provide a necessary backdrop for understanding the relationship between the support team and previous and ongoing programs. Second, a philosophical and conceptual description of the purpose of the teams will be provided. Third, the selection, training, and function of the teams will be outlined. Fourth, a case study will be provided of the operation of an Instructional Support Team in one elementary school from the perspective of a principal and teacher member of a team.

BACKGROUND INFORMATION

It is important to provide a description of the context in which Instructional Support Teams were developed in Vallejo because the program evolved as a part of a long-range, district-wide, comprehensive staff development program. The school district, itself, is a medium-sized school district by California standards, in a small urban community. The school district began developing a comprehensive district staff development program in 1976. The Instructional

History of the Vallejo Staff Development Program

The Vallejo School District began developing a district-wide staff development program. The original source of funding was the State Professional Development Program Improvement Center which, at that time, allowed services to be provided only to Title I schools. Consequently, the Vallejo program initially served only the ten Title I elementary schools. Plan were developed to include the remaining five elementary schools and the seven secondary schools. In 1978 Federal Teacher Center funds provided the resources to include all of the non-Title I schools. The Vallejo professional development programs have been funded by a variety of sources since its inception. It is now primarily funded by Chapter II and district funds.

The foundation of the Vallejo Professional Development Center training in instructional effectiveness and instructional supervision has been the work of Madeline Hunter. As the training program has grown, the work of many others has been integrated including Bruce Joyce, Gene Hall, the Beginning Teacher Evaluation Study, Fred Jones, etc. Each year, the program changes based on teacher needs, district programs, and current research findings. A strong emphasis on classroom observation, feedback, and coaching has been present in the Vallejo program from the beginning.

Current District Staff Development Program

The current district program has many components. Individual teachers may request to attend cycles during release time that focus on:

- Instructional Effectiveness (Hunter)
- Curriculum
  - The District Curriculum Management System
  - Math
  - Science
  - Social Studies
  - English
  - Writing
- Child Development
- Classroom Management
- Nutrition
- Special Needs
- Parent Involvement

Every semester a ten-week after-school series is offered for credit on topic areas of particular interest to teachers. Several after-school series on computer use are currently being given. The Bay Area Writing Project is offered in summer and after-school cycles. Every summer, workshops are offered for credit on topics identified as high interest or need areas by teachers.

The district has a system for granting district professional development to individuals and groups of teachers for engaging in professional development activities outside of the duty day. A district committee composed of six teachers nominated by the district and an administrator appointed by the Superintendent approves or disapproves requests for credit and completed activities. The Director of Professional Development is the secretary to the committee and all records are maintained in the Professional Development Department.

The district program just described provides professional development services to individual teachers. The cycles are taught by teacher trainers and augmented heavily by classroom teachers that have particular areas of expertise. Throughout the existence of the Vallejo Professional Development Center, an ongoing training program for site administrators in instructional supervision has been conducted. The Instructional Support Team training is a separate function of the Professional Development Department and will be described later in this paper.

PURPOSE OF THE INSTRUCTIONAL SUPPORT TEAMS

By 1981, the district had site administrators who had received several years of training in instructional supervision, and a large group of teachers who had been refining their instructional skills through training and daily practice in the classroom. A need existed to strengthen school-site staff development programs and support systems in addition to maintaining a strong district-wide training program. The Instructional Support Teams were formed to recognize and use the talent available at the school site and to increase the amount of feedback and coaching available to classroom teachers.

The main purpose of establishing Instructional Support Teams was to improve instruction by increasing school-site leadership and teamwork between administrators and teachers. Underlying the entire professional development program is the belief that a common language and framework for analyzing and refining teaching is essential to instructional improvement. Administrators in Vallejo play a central and important role in teaching and using a common language, but so do teachers. Teachers who have successfully applied teaching skills in the classroom provide the richest source of expertise the district has.

A strong commitment exists in Vallejo to fully develop and use school-site leadership. Each school has unique needs and strengths, and a very special set of resources. An underlying premise of the Instructional Support Team program is that each school must assume the responsibility for its instructional program, but that the district needs to provide the necessary leadership, support, and resources to enable each school to meet school and district goals.

Teamwork is a very important theme in Vallejo. There is a deep conviction that goals are best accomplished by teams. The Instructional Support Teams are one manifestation of the commitment to teamwork between administrators and teachers. Administrators are expected to provide leadership by sharing risks and decisions with teachers. Trust is best built by successfully meeting challenges together. The Instructional Support Teams provide an important vehicle for teacher leadership and ownership of the school program.

ORGANIZATION OF SUPPORT TEAMS

The Vallejo Instructional Support Team program was built on a strong foundation of individual staff development and administrative training. It is important for other districts to recognize the length and depth of previous professional development efforts in Vallejo before adopting or adapting the program. Almost every member of an Instructional Support Team has had a number of years of training and practice prior to the advent of Instructional Support Teams. This section will describe selection procedures, training, and function of the Instructional Support Teams.

Selection

Each school in Vallejo has an Instructional Support Team. The principal has the primary responsibility for working with the Central Office staff and the school-site staff to select Instructional Support Team members. Each team consists of the building principal and four or five teachers. Secondary school vice-principals are also team members. The following criteria were used to select teacher members of Instructional Support Teams:

- Demonstrated excellence in the classroom in terms of using elements of instruction to teach the state and district curriculum.
- The respect and confidence of the principal.
- Respect, confidence, and credibility with the staff.
- Previous district training in teacher effectiveness.
- Demonstrated willingness to learn and help others learn.
- Willingness to commit time to meet with the support team, train other teachers, and act as a peer coach.

Instructional Support Team members do not receive additional compensation. They are provided with release time to attend training and, whenever possible, are released to observe other classrooms and provide feedback to teachers.

Instructional Support Team Training

The 1983-84 school year marks the third year of existence of the Instructional Support Teams. Each year has had a different training focus. The first year focused on developing skills to observe and analyze teaching and plan and deliver instructional conferences. The second year focused on developing skills to observe and provide feedback to teachers in classroom management. The third year is focused on developing school level instructional improvement plans for the 1984-85 school year.

Instructional effectiveness (1981-82). The training program has two basic components, in-Center training and on-site follow up. In the 1981-82 school year, the participating principals and teachers received six to eight days of training in instructional effectiveness, lesson analysis, and conferencing skills. In the Center, they focused on increasing their individual and collective skills as team members in observing and analyzing teaching and planning conferences. At the school site, the Instructional Support Team practiced their skills and developed a support network. Principals and teachers scheduled classroom observations in volunteer teachers' classrooms. They practiced the observation and conferencing skills they learned in the Center and gave one another feedback. A trainer from the Professional Development Center was also available to assist in the application of new skills. In addition to practicing their own skills, the Instructional Support Team planned ways to expand the support network by providing other teachers the opportunity to observe one another's classrooms and provide each other feedback.

Classroom management (1982-83). In the 1982-83 school year, school-site support teams were trained in the area of classroom management based on the Classroom Management Training Program developed by Fred Jones. They received six to eight days of training in the Center. At the school site, they trained other staff members in classroom management techniques. Classroom observations and conferencing continued. The support teams increased their repertoire of skills so that they could assist their peers with classroom management as well as their instructional skills. Some support teams were also involved in planning curriculum implementation activities at their school sites.

School level planning (1983-84). The 1983-84 school year focuses on training school support teams in the areas of school effectiveness research and school-level planning. Each school will develop the capacity to develop and implement a year-long plan which will reflect the school district's Five-Year Instructional Improvement Plan. The team will also develop plans for continuing observations and conferences and training in classroom management.

During the early part of the 1983-84 school year, the Instructional Support Teams will receive training in school effectiveness

and a district-adopted planning process and format. They will receive updates from all Instructional Division Departments regarding the components to be included in the plan. During Spring 1984, the Instructional Support Team will work with their school-site staffs to write a School-Level Instructional Improvement Plan for the 1984-85 school year. The following components will be addressed in the plans:

- Use of Standardized Test Data
- Instruction
- Curriculum Implementation
- Staff Development
- Computer Education

Function of Instructional Support Teams

Each school has used its Instructional Support Team in its own way. Functions that are common to all schools are training and coaching. Every team has done some training of its school staff in areas in which the team, itself, was trained (instruction and classroom management). Every team has provided coaching to teachers and many teams have also assisted in curriculum implementation efforts. The district has recently adopted new continua, criterion-referenced tests, student profile cards, report cards, and courses of study. Many of the Instructional Support Teams have helped see that the curriculum is actually used.

Principals have used Instructional Support Teams as problem-solving groups. The Instructional Support Teams may advise the principal and assist in the planning and implementing of any activities which affect the school. Principals express enormous enthusiasm for having a group of teachers to provide staff input and help in decision making.

Each Instructional Support Team has made decisions about the readiness of the school-site staff and the appropriateness of specific activities. In some schools, a great deal of teamwork and communication already existed and the Instructional Support Team was a natural extension of existing activities. In other schools, many teachers had been operating in isolation for some time and the initial activities of the Instructional Support Team focused on building trust.

A very important distinction of function which needs to be made clear is that the Instructional Support Team is not involved in teacher evaluation. Because peer coaching is a somewhat new phenomenon, this was an important clarification. Classroom observation by support team members are always voluntary on the part of classroom teachers. Under no circumstances would Instructional Support Team observations become a part of personnel evaluation data. In many schools, teachers have requested Instructional Support Team

assistance in the accomplishment of evaluation objectives, but these interactions are not part of the personnel record.

It is very important for each Instructional Support Team to explain its function to the rest of the staff. It is designed to be a support system for teachers, but apprehension has been expressed by some teachers. The Vallejo Education Association president has been very helpful in clarifying the intent and use of the Instructional Support Teams in allaying fears of teachers.

CASE STUDY

Every school, from the smallest elementary school in Vallejo to the largest comprehensive high school, has an Instructional Support Team. This case study focuses on Cooper Elementary School. Cooper School was chosen because it has a new principal and a staff that did not have a history of working together or a strong support network. Cooper School provides a relevant case study because it's a school that had to start at the beginning in terms of building an Instructional Support Team and gaining staff acceptance.

Principal's Perspective

Ellen became the Principal of Cooper School in the Fall of 1981, the year Instructional Support Teams were formed. When she came to Cooper School, she found a dedicated staff of individuals who were accustomed to working in isolation. She followed a principal who almost never held staff meetings. Her major goal during her first year as principal was to develop staff cohesiveness and begin building a collective commitment to instructional improvement. The Instructional Support Team was a vital part of Ellen's plan and she made her team a very high priority in her own schedule.

Forming the Instructional Support Team was a challenge for Ellen. Very few of her teachers saw themselves as leaders. She convinced three members of her staff to be on her Instructional Support Team. One member was a primary grade teacher with 18 years of classroom experience whom Ellen knew as a colleague at another school earlier in her career. She had high regard for Dorothy as a classroom teacher and asked her to be on her team. John, an intermediate-grade teacher, was active in setting up school-wide sports programs. In addition to being a strong classroom teacher, he was well liked by the staff and brought a school-wide perspective to the team. Linda, a kindergarten teacher, had previous experience as a resource teacher in categorically funded programs. She, too, brought to the team an understanding of the school as a whole in addition to highly successful classroom teaching experience.

Ellen made the establishment of the team itself and a beginning acceptance by the staff her first goals for the Instructional Support Team. During the first semester of the first year, the members of the team met with Ellen just to establish themselves as a team. Later in the year, Ellen and the Instructional Support Team began explaining their purpose to the rest of the staff. Most of the on-site practice of lesson analysis and conferencing skills occurred within the team. A few visits were made to classrooms of teachers who showed a strong interest in and willingness to received feedback.

During the 1982-83 school year, the Cooper Instructional Support Team expanded its efforts. Team members were assigned to work with individual teachers. The Instructional Support Team did not necessarily work in depth with every teacher on the staff. They assigned themselves not by grade level but by interest, and began forming support relationships with other teachers. For instance, Dorothy assisted teachers who had classroom management concerns. John worked with teachers who were interested in receiving feedback and coaching on their instructional skills. Linda worked with teachers who were interested in more fully developing their reading programs or in implementing the bay Area Writing Project.

The response of the staff was varied. Some staff members were very open and receptive to peer coaching. Other teachers were more tentative and reluctant. The Instructional Support Team honored the readiness of individual teachers. Team members made themselves available to the staff and worked in a variety of formal and informal ways based on the responses they received. Ellen and her team agreed it was more important to be sensitive to the staff and to build sound relationships than to jeopardize the team's effectiveness by rushing staff acceptance.

During the Spring of 1983, the Instructional Support Team did some staff workshops in classroom management based on the training the team had received at the Professional Development Center. The staff response was very positive. This gave added confidence to the Cooper Instructional Support Team and also provided an avenue for increased support activities with the staff. Several staff members requested assistance with classroom management after the on-site workshops.

Ellen expanded her team during the 1983-84 school year. Linda was transferred to another school. Two new members have joined the Instructional Support Team to learn the district planning process and work on the school plan. Unlike the beginning of the Instructional Support Team program, Ellen had more teachers wanting to be on the team than training spaces available. She created an expanded Instructional Support Team by developing roles for individuals who make specific contributions to the school program. One member of the expanded team is training the rest of the staff in the use of computers in the classroom; another member is providing training in

the use of the District Curriculum Management System; and a third member is responsible for school-wide sports activities.

Ellen speaks glowingly of her Instructional Support Team. She found it invaluable as a first year principal to have a group of advisors who already knew the staff. She finds that many of her objectives for improving instruction at Cooper School are best carried out by teachers helping teachers. Ellen places real value on Instructional Support Team activities and allocates a generous amount of time to meet regularly with her team. She has seen vast changes in the Cooper Staff since Fall of 1981. In 1981 very few teachers chose to attend training at the Vallejo Professional Development Center. Most classroom doors were closed and many were locked. By Fall of 1983, every teacher in the school signed up for at least one training cycle at the Professional Development Center and many teachers were opening their doors to their colleagues. Ellen credits the Instructional Support Team with much of this success. The members of the Instructional Support Team give much credit to Ellen for her leadership, commitment, and sensitivity.

Teacher's Perspective

Dorothy had been a classroom teacher for 18 years when Ellen came to Cooper School. Ellen and Dorothy began teaching the same grade in the same school as first year teachers. Dorothy respected Ellen and wanted to support her. Dorothy remembers clearly the day Ellen asked her to consider being on the Instructional Support Team. She recalls thinking that she was very comfortable in her role as a classroom teacher. She recalls being much less comfortable with the idea of being a coach to her peers. This was not a role she had envisioned for herself, but she agreed to accept Ellen's invitation.

Dorothy agrees with Ellen that it was important to take the time to build the team's confidence and to begin introducing the team to the rest of the staff. Assigning team members to individual teachers was an effective way to begin. It provided team members with a narrower focus based on individual interest and expertise, and limited the number of teachers with whom to establish a working relationship. Dorothy did a lot of informal visiting after school and talking with teachers to begin establishing rapport. Eventually, she began visiting some classrooms. Dorothy has particularly vivid memories of working with a teacher who had a difficult class and a number of classroom management concerns. The previous year Dorothy had a similar class, so she had a great deal of first-hand experience as well as more recently acquired techniques to offer her colleague.

Dorothy is very enthusiastic about her experiences as a member of the Instructional Support Team. She has learned many new skills, gained a great district-wide perspective, and developed her leadership abilities. She also expresses articulately the benefits to the school staff. She sees much greater enthusiasm for teaching with her

fellow teachers, a commitment to ongoing staff development, and greater staff cohesiveness. Dorothy's own career has changed as a result of her Instructional Support Team experience. In Fall, 1983, she became the Instructional Associate at Cooper School. The Instructional Associate's position is funded by the school's State School Improvement Program. Dorothy finds herself full time in a resource teacher or program manager role. Her Instructional Support Team training and experience are invaluable as she fulfills new responsibilities at her school.

SUMMARY

Vallejo has found many advantages to establishing Instructional Support Teams: (1) The Instructional Support Team concept promotes shared responsibility between administrators and teachers. Principals are expected to develop their own skills in instructional effectiveness and share the responsibility for the school program with teachers. Teachers are expected to play an active role in working with the principal to make key decisions about instruction. (2) The focus on classroom visitations, observations, and conferences reduces the "loneliness" of the classroom. There is a great deal more interaction between professionals over matters of importance when there is a planned program rather than an occasional burst of communication over problems. (3) The Instructional Support Team builds leadership capacity. In every school there are teachers who have the interest and ability to share their well-developed expertise with their peers. Too often because of time constraints and past practice, their talents were not tapped. The Instructional Support Team provides a vehicle for developing and using staff expertise.

After some initial apprehension on the part of some teachers, the support teams have achieved overwhelming success. The president of the local Teachers' Association has heartily endorsed the teams and encouraged all teachers to view and use the team as a resource. The district administration is thrilled with the surge of teacher leadership and the productive, collaborative relationships between teachers and administrators that have resulted from the program. Principals feel extremely well supported and teachers have expressed a great deal of enthusiasm for the peer support that is now available to them.

"As enrollment has declined and teachers have left the profession, existing staff have often been reassigned to shortage areas, and many California teachers are not now working in their primary subject area. A mentor assigned as a lead teacher might help existing staff upgrade their skills in the newly assigned subject area."

"The Mentor Teaching Program is a new opportunity and will require thoughtful planning in order to support educational improvement. Given the broad scope of the initiative, it is unreasonable to expect that the program can accomplish all goals; it is thus essential that teachers and administrators work together to define what the program can do."

THE CALIFORNIA MENTOR TEACHER PROGRAM

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Thank you very much for inviting me to speak on the Mentor Teacher Program in California. This is an exciting time in education, nationally, and particularly here in California where Senate Bill 813--an omnibus educational reform package passed the Legislature this summer.

The bill is one of the most comprehensive education finance and reform measures ever enacted in California, and contains over 80 separate reforms designed to:

- Strengthen high school graduation requirements.
- Improve the elementary and secondary curriculum.
- Tighten student discipline standards.
- Streamline teacher dismissal procedures.
- Improve school-level management.
- Attract and retain high quality staff.

In 1983, Senate Bill 813 provided an 8 percent average increase for school districts, with appropriations totalling over $800 million dollars. And, while much of the 1984-85 funding was cut, the funds which were appropriated are assisting to both implement the reform agenda and offset budget reductions occurring since the passage of Proposition 13.

I mention these other initiatives in the reform package because it's important to address the Mentor Teacher Program within the total package of reforms rather than attempting to implement each piece in isolation. In the area of staff development, the law provides for a new teacher evaluation procedures, credential requirements for teacher trainees, grants to improve and reward classroom instruction and provide stipends for mentor teachers working in a staff development capacity.

There are a variety of teacher incentive plans which have been proposed and enacted in the United States. Tennessee and Florida both have teacher career ladder plans tied to evaluation and salary. These new proposals are supported by smaller scale efforts like the one which has worked quite successfully for 30 years in La Doue, Missouri.

The California Mentor Teacher Program is of a slightly different variety, in that this master teacher proposal, while intending to improve the structure of the teaching profession through a career ladder has a staff development component as its central activity.

The primary goals of the Mentor Teacher Program are twofold:

1. First, to retain and recognize excellent teachers, and

2. Second, to improve the profession by making individuals with particular expertise available to assist others

These goals are to be accomplished by selecting mentor teachers and designating part of their professional role for staff development with new or experienced teachers. Where appropriate, districts may also have mentor teachers work in curriculum development functions. In return, mentors will receive a $4,000 annual stipend and serve up to three years as "mentors."

Mentors are not selected on the basis of principal evaluation, and they are specifically prohibited from participating in the evaluation of other teachers. Rather, the primary function is to provide a process for teachers to receive assistance in a collegial setting for new and experienced teachers. In addition, mentors may work in curriculum development or with teacher trainees.

The teacher trainee provisions in SB 813/1983 (Sections 25.5, 44325) authorize the Commission on Teacher Credentialing to issue certificates to allow persons with baccalaureate degrees, but no professional training to teach in secondary schools, (grades 7-12). Teacher trainees are to work within a professional development plan and be guided and trained by a mentor teacher.

Mentors are not given additional pay simply because they demonstrate merit. Rather, they are compensated at a higher rate because they perform different duties, and work longer hours than their peers. Neither the teacher trainee nor the mentor teacher provisions are prescriptive. Both are implemented at district discretion. Thus, districts have considerable flexibility to design mentor programs within an overall approach to upgrading instructional quality.

SB 813 authorizes districts to designate up to 5 percent of their teachers as mentors. Undoubtedly, many more teachers could qualify and serve with distinction in the mentor role. Hopefully, this initial authorization for mentor teaching will be a first step in creating a variety of career ladders for classroom teachers. However, current funding levels restrict the number of mentors that can be selected.

The Mentor Teacher Program is a new opportunity and will require thoughtful planning in order to support educational improvement. Given the broad scope of the initiative, it is unreasonable to expect that the program can accomplish all goals; it is thus essential that teachers and administrators work together to define what the program can do. Issues to consider in developing mentor programs include:

1. The importance of collaboration with appropriate groups in program planning. The success of a Mentor Teacher Program will depend in large measure on support and commitment from all those involved--teachers, governing boards, administrators, and other interested parties. District governing boards intending to participate in the mentor program need to work with these groups to establish a collaborative approach to program planning.

2. Program design reflecting local needs and priorities. Staff training activities and support are critical elements for fostering teacher and organizational change, and sustaining these changes in sufficient depth to impact student achievement. However, there is no single unitary system for providing staff development. Thus, how the mentor program is used in individual school districts is expected to vary widely.

Nevertheless, the program should not stand in isolation, but will relate to other initiatives requiring broad-based support from teachers and administrators (School Improvement, AB 551, Student Study Teams). Outlined below are some approaches which have been used in master teacher programs, which might be modified to define "mentoring" roles.

a. Lead teacher or master teacher assigned to provide staff development for school staff. As enrollment has declined and teachers have left the profession, existing staff have often been reassigned to shortage areas and many California teachers are not now working in their primary subject area. A mentor assigned as a lead teacher might help existing staff upgrade their skills in their newly assigned subject areas. In this configuration, a mentor teacher would be assigned as a staff developer at a school site. A mentor might:

   - Provide training, classroom observation, conferencing and coaching support for a group of teachers being retrained.

   - Function as a content and methodology specialist at a school site for designated grade levels or content areas.

   - Teach a regular sequence of courses, and be observed by other teachers

b. Mentor as trainer of new teachers or teacher trainer. The first year of teaching is the most difficult, as research suggests that much of what teachers learn about teaching is learned "on the job." Hence, mentors could work with newly hired fully credentialed teachers to help upgrade their content knowledge, refine their instructional skills, and develop effective classroom management systems. Should a district elect to use teacher trainees, mentors would have a central role in managing a professional development program for these persons.

c. Mentor teacher as "fellow" in teacher training academy. Another approach might be to group mentors in a teaching academy where teachers with particular expertise would constitute a "demonstration" school. Schenley High School in Pittsburgh, Pennsylvania provides such an example. This program provides a clinical teaching experience in a regular high school where teachers observe exemplary instructional activities, are able to practice and receive feedback on instructional skills, and receive continued support for using new concepts, skills, and processes in their own instruction.

d. Mentor teacher as "curriculum developer". Finally, mentor teachers may be assigned to develop and install new curriculum materials. There is substantial evidence that the quality of textbooks and instructional materials has declined as students have increasing difficulty in reading materials "at grade level". In addition, there is frequently a mismatch between the classroom text, instructional content and standardized tests. Thus, mentors might be designated to work in the summer or in noninstructional time to develop curriculum and assist in classroom-level implementation.

3. Attention to issues of nomination, observation, and selection. California Education Code Section 44495 defines a nominating process for selecting mentor candidates to be referred to the governing board for designation. The majority of the selection committee is composed of classroom teachers, chosen by other teachers, with the remainder of the committees composed of school administrators. The selection committee is directed to consider involving parents, pupils, or other public representatives in the selection process. The selection process includes provisions for observation of classroom teachers. The final designation of a person as a mentor is by the district governing board.

   Districts have considerable flexibility to define the criteria for mentor teachers. The law provides only that mentors:

   a. Be a credentialed classroom teacher with permanent status (permanent status means tenure in those districts which grant tenure or three years experience in districts which do not grant tenure)

   b. Has substantial recent experience in classroom instruction

   c. Has demonstrated exemplary teaching ability, as indicated by, among other things, effective communication skills, subject matter knowledge, and mastery of a range of teaching strategies necessary to meet the needs of pupils in different context

4. Support for mentor teachers in their new roles. Teaching adults is a significantly different process from teaching children. Adult motivations, habits, attitudes, and skills are different from those of children and need to be accommodated in the training activity. Most mentors will be working as advisors to the teaching process. Hence, if the mentor is to observe and work with teachers in classrooms, the mentor needs expertise in observation, conferencing, and clinical teaching support. If the mentor lacks expertise in these areas, training mentor needs to be provided.

   Commitment from site administrators and teachers for work with the mentor is essential. Mentor teachers are most likely to work with teachers at individual school sites. Observing in classrooms, sharing instructional strategies, modeling teaching ideas, and providing resources will require a strong degree of trust among mentors and site teachers and administrators.

   Reasonable expectations about what mentors can accomplish will also be essential if mentors are to be well used. The law states that not less than 60 percent of mentor's time shall be spent in direct instruction of pupils, but this doesn't preclude individuals from spending more or even all of the time in direct instruction of pupils, (e.g., the "training academy" notion). Further, if mentor teachers are to improve instructional quality, their duties must be thoughtfully planned in light of specific local needs and goals for improving curriculum and instruction.

   Finally, provisions need to be made to ensure that mentors are supported in their new role as supervisors, not as evaluators. As participants in a new activity, mentors will need to be given opportunities where they can share and improve upon their mentoring skills.

Current and future year funding. The Legislature appropriated $10,800,000 for the Mentor Teacher Program for the second half of 1983-84. Full funding of 5 percent of the state's approximately 165,000 full-time certificated teachers would require $49,500,000 or $24,750,000 for half of a year. AB 70/1983 allowed the State Superintendent to decrease the 5 percent percentage multiplier to accommodate current funding levels and allow all interested districts to participate if they choose, but at a reduced number of mentors (estimated to be 2 percent of the state's teachers). Thus, mentors will serve only one half of the 1983-84 school year and the state will apportion $2,000 per mentor for stipends.

Section 26 of AB 70 defines district allowances for administrative costs of participating in the program. At least two-thirds of the funding is to be used for stipends; thus, each district's 1983-84 allocation of funds will reflect a 2:1 relationship, with $1,000 of administrative cost funding for each $2,000 of stipend funding.

Mentor stipends are not to be counted as salary or wages for purposes of calculating employer contribution rates or employee benefits under the State Teacher's Retirement System. Governing board may designate mentor teachers for a period not to exceed three consecutive school years. Upon completing three years as a mentor teacher, an individual may be reviewed and renominated.

In summary, The California Mentor Teacher Program is an important initiative designed to upgrade the quality of instruction. The program provides an exciting opportunity to reward excellence in teaching while implementing the reform mandate we have been given. This is a new program and as such, we have few examples to follow for statewide implementation. Done carefully, with district needs and priorities driving the process, mentor teachers can make a powerful impact. Done poorly, the positive benefits of teachers helping other teachers may be lost in a cloud of minutiae. Thus, we are doing what we can to tie the mentor teacher program to the broad reform agenda for public schools, and we urge you to do the same.

CHAPTER 6

MICROCOMPUTER APPLICATIONS IN EDUCATION

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"Teaching computer programming is just as difficult as teaching mathematics or teaching reading or any of the other disciplines. We would not tolerate people who had had one credit worth of reading or math being a reading teacher or a math teacher. So why do we tolerate people with that level of training being computer programming teachers?"

"No matter how many computers we get, no matter how good the software gets, quality education is going to depend on quality teachers. Educators looking to the future will need to put money into hardware and software, but they will also need to put a lot of money into teacher education if they're going to have teachers who can take advantage of this hardware and software."

"Our educational system continues to stress a system of rote memorization, of developing skill and machine-like operations which are done with paper and pencil like dividing fractions. Is there anybody here who has found the need to divide one fraction by another by hand sometime this week?"

"Right now computers are in short supply in education, and our thinking about computers in education is inhibited by fears about their expense, their maintenance and the difficulty in learning to use them. If all those fears were resolved, the question would be what difference would computers make in education?"

MICROCOMPUTER APPLICATIONS IN EDUCATION: NOW TO NEXT DECADE

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Right now we are involved in a very massive change as far as education is concerned. If you like change, if you like to be involved in it, then you were born at the right time. On the other hand, if participating in massive change bothers you, then you're in for trouble. A Carnegie Commission Report, The Fourth Revolution, spoke about the four major revolutions in education: the first was the invention of reading and writing; the second was the concept that we would have schools and professional educators; the third was the invention of the printing press; and the fourth revolution is going on right now, the electronic revolution.

There's a division, a very superficial one in some ways, but a division between the world of education and the world outside of education. And part of what I'll talk about today is the world outside of education because it gives a very good indication of where we might be headed within the world of education. If the difference between what's outside of education and what's inside of education gets too large, then people outside of education react in various ways. They start private schools or they put in a new school board or they vote down school taxes.

Inside education, computers are starting to be available. In the United States the latest statistics suggest there's approximately one microcomputer for every 125 students. The ratio in California might be closer to one microcomputer per 100 students. Let's suppose that one microcomputer per 100 students was really used efficiently, what would that mean? If you schedule carefully, the average student might get four minutes of computer time a day--or if you're really super efficient, five minutes of computer time a day.

We're just barely beginning in this field, but let's look at what's apt to happen over the next four or five years. Let's suppose you're a relatively poor school district of $2,000 per student per year and for some reason you decided that computers and computer technology were important. Could you find one percent of your budget to put into that year after year? If you put up $20 per student per year and if you're willing to settle for medium quality microcomputer systems, one year's worth of money will give you a ratio of one machine per 50 students, which is probably twice the California average. And if you do that a second year, you will have a ratio of one per 25 students and if you keep doing that, it will lead you to a ratio of approximately one machine per 15 students--if you're willing to settle for that kind of machine. Of course your machines

start to wear out and you have to put up some money for maintenance and repair and so on. Whatever type of situation you're in right now, chances are you are nowhere near that fairly easily achievable goal of one machine per 15 students.

If you're a slightly wealthier district, maybe a $3,000 per student per year district, and you decide to put up one percent, how might you spend the $30? Well you might spend $5 per student per year on teacher training. You're probably already putting that much money into teacher training. It could be scheduled for computer inservice. And you also probably already have five dollars per student per year for books, films, and support materials. This could be used for computer books and support materials. The five dollars per student per year for software could be taken from the library funds. So it may be the case that to use $30 per student per year for computer education, you only need to find $15 per student per year that isn't already there.

The sense of direction of the cost of computing in education is that it very easily could reach the five percent level. Colleges and universities around the United States have started to gravitate toward the three percent solution or the four percent solution. A progressive school district may decide to go for the two percent solution. What could you do with a two percent solution? Well roughly speaking you can do twice as much as the one percent solution and after a number of years you might well end up with a ratio of approximately one machine for seven students, or 40 minutes per student per day on the machines. Now that starts to be enough to make a significant difference in education.

The point of this analysis is that it doesn't take huge amounts of money. It takes one percent of your budget or two percent of your budget or something akin to that to begin to generate enough hardware, software, support materials, and resource people. This is needed if computers are going to make any difference in education. So the question then becomes are computers going to make any difference in education? What are computers doing and what can they do?

I want to talk a little bit about the world outside of education and then I'll try to relate what's relevant to the business world to what's relevant to the education world. First, I'll give a few examples of commercial uses of the new technology.

Outside Education: Robots, Wristwatches and Laser Disks

An article talking about the production of robots in the United States says it will be a 250 million dollar business this year. Two hundred and fifty million dollars worth of robots. Robots costing in the range of $50,000 - $100,000 apiece. And each robot does the work of several human beings. A very crude rule of thumb would be one robot might do the work of three to four people but require one

person to maintain it. So three or four jobs go away and one job gets created. The job that gets created is quite different from the jobs that go away. Does this have any impact on education and what we're doing in education? It certainly scares some people.

We tend to think of a calculator as a simple minded thing--it adds, subtracts, multiplies and divides. But I bought a calculator that had a little printer on it and it had a built in calendar so you could punch in any year and month and it would print out a calendar for that month. Our educational system has coped with calculators quite well. Namely it has ignored them almost completely. Nearly every adult owns and uses a calculator and seems to think it's perfectly appropriate to do so. Somehow or other if you're an adult you have done whatever you were required to do in school in the area of learning to do arithmetic and now as an adult you can do what seems most practical to you. But our educational system continues to stress a system of rote memorization, of developing skill and machine-like operations which are done with paper and pencil like long division of multi-digit numbers, computation of square roots, or dividing fractions. Is there anybody here who has found the need to divide one fraction by another by hand sometime this week?

The wave of the future in terms of phonograph records is to have smaller records. There is a laser disk that stores music. This disk is somewhat less than five inches in diameter and holds about one hour of music. It has a capacity for six billion bits of information. Now I want to try to translate that into something. Six billion bits is a way to encode one billion characters in capital letters and digits. And one billion characters is the equivalent of one thousand 500 page novels. So we now have the technology to mass produce and sell cheaply a different medium for storing huge libraries. One little disk which maybe sells for $10 could include the entire Encyclopedia Britannica and other huge encyclopedias as well. A different way of storing and disseminating information is coming along, and that will affect education.

There is a wristwatch on the market that has a Spanish/English dictionary built in and also gives translations of 35 phrases from five different languages. There is also a wristwatch that speaks when you push a button, and a camera that tells you when you need to load the film or if it's too dark or you're out of focus. Now this wristwatch that can talk and the wristwatch that can store the dictionary and the camera that can talk are things which can be useful learning aids.

There is a commercial product from Xerox that has built-in computer-assisted instruction. When you turn on the machine, a computer automatically runs over 100 different checks on the circuitry to see whether all parts of the machinery are working right. And if you've got some kind of a complicated copying job, you push the button that starts the computer program running which teaches you how to do the copying job. This computerized instruc-

tional system saves enough service calls and enough training costs to be an economical way to proceed. In the past we have tended to think of computer assisted instruction first of all as something that is only going to go on in the school and second as too expensive, and this is a hint that both of those are wrong.

If you walk into a research library the librarian will say we probably have the answer to whatever you want to ask. The direction of information retrieval, which is a very major part of what education is about, is computerized information retrieval systems. There are literally hundreds and hundreds and hundreds of very large scale data banks now. In the business world it is very common to tie into these data banks. Education at the college-university level is also doing this, but education at the pre-college level has not yet faced this issue. As leaders in education it's something that you'll need to face--the nature of libraries in terms of retrieval of information is changing.

Inside Education: Hardware, Software and Teacher Training

What do you think a $795 computer will cost ten years from now or twenty years from now? It might be $50. Right now computers are in short supply in education, and our thinking about computers in education is inhibited by fears about their expense, their maintenance and the difficulty in learning to use them. If all those fears were resolved, the question would be what difference would computers make in education? One possible outcome of computers in education is that the schism between what goes on in the real world and what goes on in education will become broader and that even though every student has a computer, it won't affect the content and process of education. Another possibility is that education will become better and more relevant.

The heart of the matter over the long run is not going to be this hardware issue. This hardware issue is going to go away. Eventually if we need and can appropriately use one computer per child, we will have one computer per child.

A second part of the question is the kind of software available for use. About two years ago I heard it said that 95% of what's out there is no good. That means that five percent of the stuff that's out there is pretty good. And there are lots and lots of researchers trying to make better educational software. The most recent comment is that about 80 percent of the software is no good and about 20 percent is okay. So just in the last two years there's a tremendous change. So even though software is a major problem, the issue of software is going to get to be less and less of an issue or problem.

The third component is the teacher--the teacher's knowledge, skills, and attitude. No matter how many computers we get, no matter how good the software gets, quality education is going to depend on

quality teachers. Educators looking to the future will need to put money into hardware and software, but they will also need to put a lot of money into teacher education if they're going to have teachers who can take advantage of this hardware and software.

The one percent model that we looked at had the very modest $5 per student per year put into teacher education as a starting point. Well let me tell you how to blow that money and accomplish very little good. You take one of your teacher inservice days and you say one half of one day is the computer inservice and you bring in somebody like me to talk to all the teachers in your district for two hours. And then you try to have all the teachers in your district touch a machine for five or ten minutes or maybe look at a movie or something like that. What does it cost to have a teacher in a half day inservice? It's pretty easy to see that you could blow $100 per teacher on a half day inservice and that's what you'd accomplish with your teacher inservice money for one entire year. The question is as an administrator can you do something better with your money?

Here is where the clever administrator really stands out. What you want to do is to make significant progress on this teacher education problem without spending much money on it. What can you do with your $100 per teacher per year? Suppose that we don't use the time when the teacher is getting paid. We tell the teachers there's a free course they can take in the evening. Now compare the cost of that--no matter what you pay the instructor--to the cost of using the inservice time. Not all teachers will buy it, but some of them will and you'll save yourself a lot of money. You may then ask what can I do to entice teachers to come and take this free course? If you're putting computers in the schools, you might say that the people who attend workshops are the ones who get to have a computer in their classroom.

Each of you knows what you can do in your own building and in your own school district. And each of you knows how to bend the rules in order to get things done, and what we're asking is that you do them.

Another thing you can do with very little money is to set up a corner of the teachers' lounge with a few books and a few magazines.[1] Subscribe to half a dozen different computer publications and buy a few copies of Seymour Papert's book and just set them there. Maybe teachers will read them. Think about what it costs to buy one of these books or magazines relative to the cost of paying the teacher to read it. A variation on this idea is to give the teacher a list

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[1]The largest computers-in-education professional society is the International Council for Computers in Education, 1787 Agate Street, Eugene, Oregon 97403. It publishes The Computing Teacher and many booklets for teachers. Write for a free catalog.

of books and say, "If you will agree to read this book, I'll buy it for you." That's a very cheap form of teacher training.

What kind of person do you want to be the computer specialist in your elementary school or your secondary school? We may not have any choice right now since we're trying to get started. We take the teacher who's most interested, who gets started, who's self taught. But our goal is to have the same level of competence that we depend upon and require in every other discipline. And we have a long, long way to go, and we're not going to solve that problem by waiting for the colleges and universities to produce all these high quality people who are going to do it for you. If you want something reasonable to happen over the next five, ten, 15 years it's mainly going to come from inservice education. As principals and superintendents, leaders in education, you know how to do inservice education. You know how to have it happen, so take it upon yourself to do something about it.

Let me give you an idea of what you might be aiming at. Let's describe some levels of an inservice model for computer education. The goal of this inservice is that all teachers should become computer literate. When we start to translate that into some sort of processes, the first activity is usually some kind of a workshop. The workshop is not having a guest speaker to all of the teachers in your district at one time. It is four hours of very carefully taught hands-on experience where teachers look at various pieces of computer equipment, use different pieces of software, do a little bit of reading, and begin to get some feeling that they can learn to do the same things that their students are learning to do.

The second level in the inservice is for the teacher to know enough about computers to bring their students to level one (described in the above paragraph). Level one and level two are maybe the most you can expect for the average inservice program. But it's barely scratching the surface, and every district ought to provide higher levels of opportunities such as three-credit courses. What do you put in the first three-credit course for teachers? Level one and level two did not have computer programming. Level three has computer programming as one-third of its content. The purpose of the computer programming is not to produce someone to teach how to program computers. Teaching computer programming is just as difficult as teaching mathematics or teaching reading or any of the other disciplines. We would not tolerate people who had had one credit worth of reading or math being a reading teacher or a math teacher. So why do we tolerate people with that level of training being computer programming teachers? The purpose of level three is to give a broad general overview of many of the things that we're talking about today and to get teachers to start thinking about how computers as a tool are going to begin to change the overall content of the educational curriculum. We spend a lot of time teaching things that might not be so appropriate any more. What we're aiming at in the

computing field is to fully integrate computers into the curriculum in the same way that reading and writing is a tool in every discipline, that math is a tool in many disciplines and ought to be a tool in more disciplines.

The really big challenge is going to be to get teachers to the level where they can begin to deal with this technology in their curriculum and deal with changes in their curriculum that are dependent upon this technology. Having an overview of computers in education, learning to use a variety of software packages, learning to evaluate software, and developing some skill in using the word processor and information retrieval system turn out to be more useful than learning to program in BASIC. You can tell a high-quality teacher training course from a low-quality teacher training course almost entirely by whether it's mainly a computer programming course or mainly something else.

The information age is going to happen independent of what the school systems do. How well we succeed is a very good measure of the quality of our educational leaders. Much of what has gone on in computers in education so far has been individual teachers going out and learning on their own, often buying their own machine and using it in their own classroom. So if it's going to make some significant difference in education over the long run it's going to be because we have high quality leaders who will learn what they need to learn, and who will do what needs to be done.

"Until the number of computer-using teachers in the various subjects increases substantially, the market for software in those subjects is too limited to justify an investment in producing it. And, so long as the selection of software is limited, many schools and teachers will be reluctant to use computers in their teaching."

"A new form of Murphy's law: The program you want is only available for a machine you don't have."

"Schools can influence the future direction of growth in software by being discriminating buyers. Buy only programs that give you the most for your money. Insist on programs that can be used as tools by teachers and students, programs that can be tailored to suit your curriculum."

THE SOFTWARE PROBLEM

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When the time comes to use computers for something beyond computer programming and computer literacy, the software problem looms. There seems to be a great deal of software: simply wading through all the titles searching for what you want can be a day's work. But try finding some software to teach exactly what you need taught and you will, at least nine times out of ten, encounter the software problem.

Why is it so difficult to find good educational software? Is there anything a teacher or school administrator can do to alleviate the problem? Is it likely to get better in a few years? These are the questions I will consider in this section. In considering them I will need to begin with the more basic issue of how computers are used in schools.

Computers in Schools: Varied Patterns of Use

Computers can play a variety of roles in education, ranging from the most marginal of roles--as a supplementary optional activity for a few students, to the major role as a "teacher" of a course. Much of the excitement about computers in education is attached to the idea of the computer as a "teacher" in its own right--as a Socratic tutor, as a magnificent diagnostic device locating and remedying students' misunderstandings, or as the ultimate audio-visual device branching students through the Library of Congress on personalized learning paths. But the present reality is that computers play mainly a marginal role in schools except in computer programming and computer literacy classes and such vocational courses as typing, accounting, and electronics.

The software problem is relatively mild in these applications because teachers can use the software developed for more general purposes, such as operating systems, languages, word processors, accounting programs, and the like. But when we turn to important applications of computers to mainstream academic courses such as English, math, science, social studies and languages we find the software problem much more severe. We also find, and it is no coincidence, that use of computers as a major part of the teaching of these academic subjects is quite rare today.

That the software problem is most severe in mainline academic subjects is an important clue to some of the origins of the problem. In those educational applications where computers are now being widely used--computer literacy, programming, vocational applications--generally only a single piece of software is needed, an operating system, a language, or a word processor. In the teaching of an academic subject like algebra, however, perhaps as many as a dozen or more substantial programs will be needed if the computer is to be useful over the entire course. If we

multiply the number of subjects taught (perhaps an average of 8 per year) by the number of grade levels (12) by the number of programs needed per course (say 10) we see that nearly 1,000 programs are needed simply to cover the public school academic curriculum with only one program per topic.

So, even though software seems to be flooding the market--our files at Stanford include over 100 catalogs of educational software with more than 3,000 titles--coverage of the software needs in academic subjects remains spotty. When you consider that most of the items in the catalogs are concentrated in a few subjects and topics (elementary math drill and practice, spelling, and computer literacy), it is easy to appreciate the enormous variety of the demand for software. This variety means that the market for any single piece of software filling only one of these thousands of niches will be smaller than the market for more generally useable programs. Until the number of computer-using teachers in the various subjects increases substantially, the market for software in those subjects is too limited to justify an investment in producing it. And, so long as the selection of software is limited, many schools and teachers will be reluctant to use computers in their teaching. This is the familiar Catch 22 situation that confronts any innovation, but the fragmentation of the market into so many niches makes the problem more severe in the case of substantial applications of computers to mainline academic subjects.

Good Educational Software

Computers have been called "chameleons in the classroom" because they can be used in so many different ways. Computers used for drill and practice with individual students seem so different from the machines used as an "electronic blackboard" to present animated geometry diagrams or from the machines used by a small group of students in a simulation game. The differences are produced by the software: the computer may well be the same machine in all these applications.

The qualities that make a computer work well for one of these educational uses may not necessarily be desirable in the others. And this is another source of the software problem: varied criteria. A piece of software that does a good job of teaching arithmetic facts through drill and practice will not satisfy educators who want programs that develop understanding of number concepts. A program that entertains and motivates students with color graphics and animation will please those whose educational philosophy is child-centered and displease those whose philosophy is more subject-centered. Such diversity of criteria further reduces the likelihood of finding software that will be generally regarded as good and increases the number of niches in an already fragmented market.

Finally, we must recognize how high are the standards typically used to judge educational software. Few dispute that computer programs can teach number facts, but we also know that traditional methods such as flashcards, can do the same job and much more cheaply. Computers, being more costly, must accomplish more than traditional methods if their use is

to be justified economically. By extension of this line of reasoning, ways must be found to use computers to teach the most difficult concepts and skills, those which substantial numbers of children now fail to learn using traditional methods. To develop programs that achieve these high standards is not an easy task. We certainly cannot expect that anyone should be able simply to sit down and write such programs. They require thorough analysis, deep thought, and inspired design.

Current Dimensions of the Software Problem

The fundamental problem is a shortage of educational software that can be used as a major part of the teaching of academic subjects in elementary and secondary schools. The number and variety of programs needed to alleviate this shortage is large, but, as the saying goes, "you ain't seen nothin' yet." We have yet to consider several other aspects of the problem that make it larger and more severe than it seems so far. The aspects that follow are presented in no particular order.

1. Development time and cost. The best estimates of the time required to design and code a computer program range from 100 to 300 hours per hour of running time. This does not include the time needed to think up the program ideas. This translates into a development cost for a program that students might use for one hour of between $2,000 and $100,000, depending on its sophistication and complexity. By contrast, to produce text material to occupy a student for an hour is a matter of a few hundred dollars at most. And remember that the market for the software is limited by the number of machines available and the large number of small niches in the market, much greater limitations than apply to text materials.

2. Machine incompatibility. A new form of Murphy's law: The program you want is only available for a machine you don't have.

3. Software piracy. Software manufacturers are reluctant to invest in the development of products that will be copied at no charge by the customer. If one can sell only one copy of a program per school, the price necessary to recover the investment must be large, between $300 and $500 per copy. This, obviously, makes it prohibitively expensive for a school to buy enough copies to supply one for each computer and therefore ensures either that the software will only be used as a supplement or that it will be illegally copied.

4. Locating and reviewing software. Even when good software exists, finding it and verifying that it is good are nontrivial problems. Indexes are beginning to appear that list software by subject, grade, and other useful properties, but at this moment coverage of such indexes is spotty. A number of journals publish reviews of software, but finding a review of the program you have in mind remains difficult. What we need are specialized publications that review programs in a small area with particular reference to their usefulness in the classroom. Again, we are confronted with the problem of a plethora of small niches which make it uneconomic to provide reviews to such a small audience.

5. Competition for the home market, rather than the school. The number of installed machines in homes far exceeds the number in schools, and individuals buy a total dollar volume of software several times greater than schools. Software manufacturers can therefore sell to a larger market by producing for the home. And most of them do. This means that software is designed primarily for conditions in the home--one student per computer, unsupervised use, episodic use with little extended continuity in the development of skills and ideas.

6. Problems in integrating software into the classroom's other activities. Even a well-designed piece of software will not fit exactly into a given teacher's plans. Adjustments must be made to accommodate it. If the software is not modifiable, then all the adjustments must be made elsewhere, and there are limits to a teacher's willingness to tailor everything else to one program. And when a teacher uses several programs in the course of a year, each of which requires a different set of adjustments, the problem may become insurmountable. Examples include the spelling program whose words do not match the teacher's goals, the math program which introduces skills in a different sequence from the school's curriculum, and the science program which uses a different notation from that in the textbook.

All these difficulties translate into a higher cost to provide the software needed. The cost of equipping a single course in one school with enough software to be used one hour per week for 30 weeks in a school year, assuming appropriate programs were available at today's typical price of $50 per diskette, and an optimistic 'playing time' of three hours per diskette, and one diskette for each three students in a thirty-student class, comes to $5,000. This figure is too expensive by a factor of ten. So long as costs are this high, the market in schools will be thin.

What To Do?

What can be done today to overcome the software problem? The software problem manifests itself as an economic problem, even though not all of its causes are economic. The home market for educational software programs will likely continue to be bigger and richer than the school market, and therefore software companies will continue to produce for that market. Eventually, competition for that market will make the smaller riches in the school market relatively more attractive, and we will then see more production of software specifically for schools. In the meantime, however, the home market is far from saturated, so the present situation is likely to continue for some time.

Only large-scale actions would change this economic situation substantially. If the government and private foundations could be persuaded to finance dozens of software projects in education, that would make a dent in the problem. If districts formed consortia and invested their own funds in the development of software, that would have a significant impact. Million dollar contracts between software development houses and school districts to develop software collaboratively and share royalties would have an effect. And the simple growth of a school market for software will, in itself, stimulate more and better software.

Progress in this fundamental aspect of the problem requires growth of investment or expenditures or both. If this growth fails to come or comes slowly, the software problem will not improve, regardless of anybody's good intentions or hard work.

In the present thin market, buyers' decisions have an immediate and powerful shaping effect on producers. Those products that sell will be widely imitated, while those that do not will rapidly disappear from the catalogs. Schools can influence the future direction of growth in software by being discriminating buyers. Buy only programs that give you the most for your money. One measure of the value of a piece of software is the number of student-hours of use per dollar of cost. This figure ought to be computed in reviews of software prior to every purchase. Another important quantitative indicator is the extent of your curriculum covered by a program. One that is useful in only 1% of a year's classes is less valuable than one useful in 10% of classes.

What actions can an individual school or district take to cope with the software problem? One thing that should be done is old-fashioned curriculum development. Scope and sequence charts are needed showing just where what types of computer programs can be used and teacher's guides showing how they can be integrated with the other ingredients of a good course.

The problem can be eased by extensive use of tool-type programs and modifiable programs. The Music Construction Set is a program that transforms a computer into a composer's typewriter. A staff and various symbols are displayed on the screen and these can be moved around with keyboard commands or a light pen to compose music which can then be played by the computer with the press of a button. Such a program can be used throughout the year in a music class. A spelling program which permits teachers to enter their own words is much more valuable than one with a fixed word list. Insist on programs that can be used as tools by teachers and students, programs that can be tailored to suit your curriculum.

One type of educational software that is little known in this country but widely discussed in Europe and Japan can be used to great effect in academic classrooms. These programs are called "electronic blackboard" programs. One such program, Quadrilaterals, is published by Reader's Digest. A teacher uses this program on a single computer at the front of the classroom, with a screen large enough for all students to see. Using game paddles, the teacher is free to walk around the room while controlling the display. The teacher can choose to have text displayed or only diagrams. Questions can be posed for class discussion and then the animation powers of the program used to show the answer on the diagrams. The program is used very much like a chalkboard by the teacher, so that no extensive inservice is necessary to prepare teachers to use it. Such programs can be extremely cost-effective ways to use computers in the teaching of academic subjects.

Teachers can create their own educational software. To do this 'from scratch' in Basic or assembly language is a difficult and time-consuming activity that cannot be expected from teachers working full time. But, using an authoring system such as Pilot, teachers can develop lessons in

only slightly more time than it takes to develop ditto masters or overhead projection sheets. However, to develop software that is truly interactive and that accomplishes things conventional methods cannot remains a high art, difficult and time-consuming. It might be reasonable to expect a talented, dedicated teacher working with an authoring system after school, weekends, and holidays, to produce two or three hours' worth of such programs in the course of a year, but not more. Unless your school has an unusual concentration of these rare birds, it is unwise to rely upon teacher-made computer software for a major part of your courseware. If you are determined to rely on teacher-made software, you might consider contracting with the most able teacher-developers to spend a substantial portion of their time for a year or so developing software. You might even consider entering into a consortium with neighboring districts to pool the talents of your teacher-developers.

It is possible to lease or purchase a complete set of integrated software designed for school use. Computer Curriculum Corporation, for example, has complete computer-administered courses in most of the subjects of elementary and secondary schools. Many publishers of basal texts for the elementary school also offer computer software designed to accompany and enhance their text materials. Control Data Corporation's PLATO system offers a good selection of software for most school subjects. These integrated software systems are expensive, and they are not tailorable to an individual school's or teacher's needs, but they may be more cost-effective than assembling your own software from catalogs or developing teacher-made materials in many instances.

Over a somewhat longer period and on a larger scale, you might contemplate entering into collaborative arrangements with software developers to work on the most pressing software development needs. Consortia of districts contracting with private developers and involving local teachers in the development process can be a powerful development strategy. Collaboration is also possible with professional associations. Such initiatives put your school into the software development business and this might be difficult to arrange with your board, but they give you more control over the software than you get any other way.

In summary, the software problem is serious and can be traced to some fundamental economic causes that are not easily overcome, but there are constructive ways to cope with the problem if you are willing and able to invest the money, time, energy, and initiative. The problem will not go away in the foreseeable future, in any event, and it will only get substantially better as more organizations invest more in developing good educational software.

"Widening the gap between those who have technological competence and those who do not further limits the learning potential of those who fail to gain technological expertise. The inequitable distribution of computer learning experiences is already a serious problem; steps must be taken to alleviate it."

"A major impediment to effective use of computers in schools is the lack of curricula which incorporate computer-based activities. When software is available it is rarely incorporated into a curriculum."

"Computer learning environments have the potential for fostering higher cognitive skills including strategic planning skills and debugging skills."

THE GAP BETWEEN PROMISE AND REALITY IN COMPUTER EDUCATION: PLANNING A RESPONSE

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The current gap between the promise of computers in schools and the reality of their use in classrooms is simply too great. Before a national magazine heralds the trend with a cover story such as "Macro Expectations, Micro Outcomes: Computers Fail School," a concerted effort is needed to change the situation. Computer education can and should live up to many of the promises which have been made.

In this paper we identify several reasons for this "gap" and discuss factors schools might consider in planning programs which will bring computer education closer to the envisioned promise of computers in schools. We focus on the instructional uses of computers rather than on the managerial and other supporting uses also prevalent in schools today. The gap between the possible instructional uses of computers in education and their actual use results from a variety of reasons, many of them completely beyond the control of schools. In this paper, we focus on factors within the control of schools and reflected in school-based decision making. We draw on experiences that schools have had using innovative programs, on investigations conducted by research groups, and on insights shared by thoughtful teachers. We suggest how schools can use what is known about computers in education to design programs to meet their needs.

Project ACCCEL

The Assessing the Cognitive Consequences of Computer Environments for Learning (ACCCEL) project, in a series of investigations conducted at the Lawrence Hall of Science and the Far West Laboratory, seeks ways to increase the effectiveness of computers in schools. This project, funded by the National Institute of Education, is evaluating the cognitive consequences of computer-based experiences on students and has focused primarily on examining experiences which have the greatest potential for influencing student cognitive performance. (Additional information about the ACCCEL program is available from the authors.) The preliminary investigations of the ACCCEL project offer the beginnings of a model of computer-based instruction.

The Promise of Computer Learning Environments

Promises have been made for computer learning environments because of their great potential for fostering higher cognitive skills. As the ACCCEL project has clarified, and is discussed further below, computers can foster skills such as planning problem solutions and

debugging the proposed plan. Schools frequently point out that they wish to teach these skills.

A variety of national commissions, such as the National Commission on Excellence in Education and the National Science Board, have recently drawn attention to the deplorable state of education in our nation's schools and have called for educational innovations which encourage these skills variously referred to as the "new basics," problem solving and a "learning society. If used effectively, computer learning environments have potential for responding to this call.

The computer is a tool like the printing press or the pencil. The potential uses of the tool are great. However, serious effort and substantial resources are needed to design programs and train people who can capitalize on the potential of the tool. Six key features of the computer learning environment distinguish it from other learning environments and make it an exceptional facilitator for the acquisition of cognitive skills: (a) interactiveness, (b) precision, (c) consistency, (d) challenge, (e) complexity, and (f) provision for multiple solutions. Each of these features is examined in turn.

First, computer learning environments are interactive. Whether one is using a computer simulation, playing a computer game, or developing a computer program, there is a cyclical process of providing information to and receiving feedback from the computer. Although the time required for the response-feedback cycle can vary greatly, all computer learning environments are characterized by interactiveness. To proceed with any computer task, the learner must respond actively. That is, the learner must submit another program, initiate another keystroke, or move the paddle control. The requirement that the learner respond periodically (usually very quickly) insures some level of cognitive activity.

The quality of the cognitive activity generated in computer learning environments is dependent upon the software or programming task that is used. Although interactiveness is not unique to computer learning environments, the degree to which computer-learner interactions can be controlled and potentially used for increasing learning efficiency is an important characteristic of computer learning environments. In addition, computer learning environments are far more likely to provide rapid feedback than are other classroom environments where assignments may be returned days or weeks after.

Second, the computer learning environment is precise. To communicate with the machine, the learner must specify his message completely. In general, the computer does not make inferences, "read between the lines," or otherwise use implicit knowledge to interpret the desires of the learner. This explicitness requires the learner to differentiate among items that previously were undifferentiated, or to "think through" aspects of a problem that previously were unclear, and to give relatively complete specification of messages.

Thus, the preciseness of computer learning environments encourages students to be precise.

The computer response can also be precise if properly programmed. The precise information provided in program debugging often exceeds that in other learning environments. Rather than just saying an effort to solve a problem is wrong, the computer can diagnose some aspects of what might be wrong.

Third, computer learning environments are consistent. This consistency is manifested in several ways. If the learner provides information to the computer (in the form of a program, or a series of keystrokes), the computer will respond in a specific and concrete manner. If the learner repeats his action (resubmits the program or repeats the same series of keystrokes), the computer will give the exact same response. If the learner does the same thing, the computer will do the same thing.

The computer learning environment is consistent in a second important way. The computer will provide a consistent response (to the same input) regardless of who the learner/programmer is. An obese or a thin person, a tall or short person, a native English-speaker or a native Spanish-speaker, a black-skinned or brown-skinned person, all will get the same response from the computer, provided the same information was "fed in." That is, the feedback provided to learners does not vary with "irrelevant" characteristics of the learner. These, more or less obvious, points about the consistency of the computer learning environments have important implications for what and how much students learn since the feedback should be easier to identify, compared to other environments where the feedback is less than consistent. Consistent feedback can make learning efficient.

Fourth, the computer provides a challenging and motivating environment in which to learn. Many teachers have observed the motivational qualities of the computer in the classroom. Proponents of the use of games and simulations in learning environments state that games are good problem-solving environments that stimulate explanation, discovery learning, and formulation of strategies.

Fifth, computer learning environments are complex. Computers, computer systems, and software are multi-functional in their operation. This complexity can encourage or require higher cognitive processing. For example, the computer can require the learner to build a conceptual representation (mental model) of its operation in order to solve problems. The process of building a mental model requires several important cognitive skills. First, one must be able to organize many detailed, low-level facts into a coherent knowledge structure. Second, one must predict the operation of the computer on the basis of the model. This entails accessing one's knowledge representation in the act of writing a program. Third, one must compare the predicted with actual outcomes. Sometimes, such comparisons require interpretation of empirical evidence.

Fourth, one must diagnose the cause of discrepancies between expected and actual outcomes. Lastly, one must refine one's knowledge so that the mental model is consistent with the actual system. This process is interactive in nature, in that the cycle of prediction, testing, and refinement is repeated until an accurate model is constructed. Compared to other approaches, the computer provides a safe, cheap, and fast environment for learning a complex system (e.g., compare to costs of experimenting with nuclear reactors).

Sixth, computer learning environments provide for the presentation of problems to learners that have many correct solutions. Multiple solutions encourage divergent thinking, creative approaches to problem solving, individual expression and style, consideration of varied alternatives, and subjective judgment of appropriateness and elegance.

Schools can capitalize on these six features of the computer learning environment to foster higher cognitive skills, to achieve affective outcomes, to increase equity of educational opportunity, and to design effective teacher professional development programs. The computer provides a unique tool for schools; planning is required to maximize its power. Using computers as smart typewriters or as automated flash cards, while helpful, fails to take advantage of their full potential.

Taking Advantage of the Computer Environment: School-Based Decision Making About Computer Education

In the area of computer education, schools frequently find that realistic planning is, at best, frustrating. Even after expending much effort at the school and the district level, programs frequently appear haphazard or unsuccessful. Impediments to effective planning for computer education include (a) lack of control of hardware decisions, (b) lack of available, effective software to accomplish the desired objectives of computer education programs, (c) lack of curricula which incorporate computer-based activities, and (d) lack of appropriate training for program implementers.

Although few school districts have been able or willing to design long-range strategic plans which incorporate what is known about computers into a program which can maximize the outcomes from computer education, the opportunity exists. Before we find that computers have been placed in closets and are collecting dust, we need to capitalize on what we do know about computers in education. By maximizing the effectiveness of existing programs, we can narrow the gap between promise and reality in computer education.

Hardware Selection

Many factors contribute to haphazard planning in schools. A large number of these factors are absolutely beyond the control of

those making the decisions in schools. For example, computer hardware is frequently donated by industry, by parent groups, and by business consortia. Sometimes schools are simply not consulted about these decisions before the hardware arrives. Funding of computer education programs is often unpredictable. State programs for computer education may suddenly emerge and equally suddenly be discontinued. The federal government has increased and decreased funding for a variety of programs that directly and indirectly influence computer-based learning experiences such as equity programs, vocational training programs, and programs for the learning disabled.

The "buy now, plan later" approach to hardware selection frequently appears to be unavoidable. Nevertheless, districts which buy computer hardware now and come up with an instructional plan later are likely to widen the gap between the promise of computers in education and the reality of their use in the classroom. Planning is necessary for equitable and exciting outcomes from computer-based instructional programs. Haphazard approaches to computer-based instruction result in haphazard outcomes and leave schools open to severe criticism about the effectiveness of their computer-based instructional program.

A misplaced perception that "if you don't have a product for your expenditures, you're wasting your money," may permeate some of the decision making about instructional programs using computers. Districts may purchase hardware before adequate planning for appropriate teacher training because hardware results in a physical product which can be shown to the school board, visiting parents, and other concerned individuals. In the long run, the presence of hardware in schools could become a point of embarrassment rather than a point of pride. Before such a situation emerges, planning for effective outcomes from computer-based learning environments is required.

Schools often have the opportunity to influence the hardware selection process. Now that numerous districts have computers, it is possible to learn from the experiences of others. Clearly, schools will make more effective decisions if they have some idea about what they want the hardware to do for them, hence the need for planning. On the other hand, as discussed below, the potential uses of computers have not been fully explored so schools can expect to modify their plans frequently as new information emerges and as they learn more about the skills of their teachers and the capabilities of their students. Planning for effective hardware selection requires on-going information gathering and flexible adaptation to new situations.

Software Selection

Software selection is intertwined with hardware selection since educational software is often hardware-dependent. On-going decision making about software selection is especially important for effective computer education. New products appear on the market constantly. A major impediment to effective software selection is lack of infor-

mation about new developments. Several factors contribute to this situation.

First, the dissemination of information about educational software is poorly established. It is difficult for schools to find out about new products and frequently the only source of information is a salesperson for a particular product rather than a network or consortium of individuals who have reviewed the range of products. The sales people who generally provide information about innovation in the field of computer education have vested interests in selling their own products. A few groups such as Computer Using Educators (CUE) offer regional conferences where information can be shared. It should be noted, however, that school district budgets do not always provide funds for teachers to attend such conferences. Some states have technical centers which gather information, and several clearinghouses for educational software are now emerging, such as EPIE, funded by the National Institute of Education and located in New York, and the Minnesota Educational Computing Consortium (MECC), but more comprehensive efforts are needed.

Second, teachers have not yet developed the ability to browse through educational software in order to select software which will meet their needs. Over the years we have developed techniques for browsing through books. However, browsing through software requires a different set of skills and is frequently quite ineffective. For example, Rocky's Boots, a program which many teachers feel is one of the best examples of a learning environment which demands strategic planning and debugging, is frequently rated poorly by teachers who are given only a short period of time to examine the software. This situation results because teachers have difficulty in distinguishing the cognitive learning features of the software from the logistic features. One important aspect of teacher/professional development must be training on criteria which are appropriate for making software selection.

Third, relatively little software has been developed for the educational market when compared to the entertainment market. Furthermore, educational software is frequently targeted to the home rather than to the school, largely because the education market is thin and unpredictable and because dissemination to schools is difficult.

Much more cognitively interesting and demanding software is needed in order for schools to be able to capitalize on the computer learning environment. Given the dearth of such software, schools are teaching programming more frequently than they probably would if other software were available which stressed problem-solving skills. Programming has the advantage of providing the problem-solving opportunities and the disadvantage of not emphasizing subject matter for a specific course. Ultimately, cognitively interesting software for computer-based learning environments will emphasize problem solving using the subject matter in the particular course for which the software is used.

Fourth, distribution of software to schools is difficult. At the present time, textbook companies have the major network for distributing information to schools. When textbook companies do select software for distribution, they frequently make the same sorts of errors which are made by others unfamiliar with browsing through software. They select software which looks more like books and is less likely to take advantage of the potential of a computer learning situation.

Fifth, schools often select software because it is inexpensive or free at a software exchange rather than because it is the best. Such decision making discourages software developers. The best software takes years to develop and requires much evaluation and revision. Quickly developed tools frequently feature either drill and practice or display of information. These programs often fail to use the computer environment to its full potential and ultimately convince observers that the computer is not effective for schools.

These factors work together to discourage the selection of effective educational software. Since distribution networks are poorly developed, manufacturers are not motivated to develop products for the educational market. Since selection of software requires training and experience and since information about software is difficult to acquire, schools are tempted to make haphazard decisions.

Computer Curricula

A major impediment to effective use of computers in schools is the lack of curricula which incorporate computer-based activities. When software is available it is rarely incorporated into a curriculum. An exception is the Creative Play curriculum for upper elementary school available from the Lawrence Hall of Science, Berkeley, CA.

When curricula are available they often emphasize drill and practice rather than the higher cognitive skills which computers are capable of exercising (as discussed in the next section). Very few textbooks emphasize the higher order problem-solving skills which make the computer learning environment especially effective. Indeed, explicit instructions for higher cognitive skills such as planning and debugging programs are frequently lacking in curriculum materials, even curriculum materials for programming taught in colleges. A recent survey of textbooks for college use reveals that less than one percent of textbook pages are devoted to debugging, an activity which frequently comprises 50 percent of a programmer's time. Thus, curriculum materials have not adequately responded to the nature of the computer learning environment. The lack of effective curriculum materials greatly inhibits the possibility of making effective use of this environment.

Lack of effective curricula for computer education places major responsibility on school-based decision makers for selecting software to complement the educational program. Even if schools have decided

what they want the computer education program to accomplish, they have difficulty ensuring that the materials they select will do the job.

Staff Training

The lack of appropriate training for program implementation is another impediment to successful operation of computer-based instructional programs. The time required for teachers to develop their own computer skills is often underestimated. Since most schools have begun to implement instruction in computer programming, there has been considerable demand for programming instructors. In many cases, staff for programming courses come from the ranks of experienced classroom teachers who have little previous experience in programming. It is not unusual for programming instructors in some schools to have only six months of programming experience when they begin to teach programming. The time and support required to provide appropriate training for instructors present educational decision makers with some difficult problems. Since schools are under considerable pressure to provide programming instruction, they must respond relatively quickly, often before they have had time to develop and implement high quality training procedures for the programming instructors. Two factors prevent schools from attracting competent programmers to teaching from other sectors of the economy. First, competent programmers have higher income levels than teachers. In fact, the schools may be in some danger of losing their best programming teachers to more high-paying jobs outside of school. Second, the schools are, in many cases, looking for new instructional areas like programming to absorb experienced teachers who have been displaced by lower enrollments and school closings.

Although the training of programming instructors poses a problem for schools, this problem is not insurmountable since it involves a relatively small number of teachers. A larger and more serious problem arises when we consider the integration of computer-based activities into the mainstream of the school curriculum. If schools are to take advantage of the computer learning environment by incorporating computer-based simulations and other activities (other than programming per se) in reading, writing, mathematics, science, social studies, and art instruction, then some computer-related training will be required by the vast majority of practicing teachers and virtually all prospective teachers. The sheer numbers of people to be trained and the great diversity in the applications that teachers will have to be familiar with, make the staff development effort very complex. The general issue of staff training has wide ranging implications for the scope and sequence of any computer-based instruction and should be one of the major considerations in program planning.

School-Based Planning for Computer Decision Making

There is no question about the difficulty of school-based planning for computer education. The gap between promise and reality in computer education stems from many factors which make planning difficult. Nevertheless, experiences of schools using computers, research on computer learning environments, and reflections of expert teachers offer insight into four major questions facing school-based planners. These questions are listed in Table 1 and discussed subsequently.

Table 1

School-Based Computer Education Decision Making: Questions to Consider

1. What cognitive outcomes from computer education programs are possible and desired?
2. What affective outcomes are possible and desired?
3. How can equitable access to computers be ensured?
4. How can professional staff development be fostered?

Planning for Cognitive Outcomes

Computer learning environments have the potential for fostering higher cognitive skills including strategic planning skills and debugging skills. By strategic planning we mean the ability to combine diverse pieces of information to generate a unique problem solution; by debugging we mean the ability to diagnose and remediate difficulties in a strategic plan. These skills are objectives of most educational programs, yet, the difficulty of teaching them often results in only token consideration in curriculum efforts. Computer environments for learning can greatly intensify the opportunity to focus on strategic planning and debugging in educational programs.

Although strategic planning and debugging are the ultimate objectives of a large number of computer-based learning programs, frequently the programs are neither long enough nor intensive enough to achieve these consequences. On the other hand, many programs involve drill and practice rather than these more complex activities. Programs which emphasize drill and practice often fail to focus on any higher cognitive skills.

It is possible to define a chain of cognitive consequences from the direct outcomes of initial computer activities to more general strategic planning and debugging skills. Educational programs which move students along this chain will culminate in important cognitive outcomes.

Instruction in computer learning environments will be especially effective if the chain of cognitive consequences is clearly delineated so that preliminary experiences are designed with the ultimate outcomes

in mind. Instruction which stresses the cognitive outcomes most likely to result from computer learning environments will intensify the experience and increase the likelihood that students will gain cognitively useful information from the learning experience.

Currently, the most cognitively demanding classroom use of the computer is probably for learning to program. Activities which lead to programming expertise can form a chain of cognitive consequences from computer learning. Skilled programmers use strategic planning and debugging skills extensively. Students who learn to program the computer can acquire strategic planning and debugging skills, however, programming courses do not necessarily provide direct instruction on these skills.

Programming instruction which focuses only on acquisition of language features and not on how to combine the language features, may fail to foster strategic planning knowledge in students. We can encourage cognitive outcomes from computer learning environments by assigning problems which demand the skills desired. On the other hand, problems which focus primarily on input and output such as reading in "name", printing out "name", and so on are unlikely to require strategic planning. In contrast, problems requiring students to write guessing game programs do require strategic planning. To write a program which gives a player seven chances to guess a number between one and one hundred and gives feedback about whether the number guessed is higher or lower than the number the computer has in mind, requires a series of decisions. The programmer must decide when to generate the computer number, how to keep track of the number of guesses, when to give feedback to the player, etc. Problems which demand strategic planning and which are complex enough that they require students to do debugging increase the likelihood that students will acquire higher cognitive skills from computer learning environments. Activities which lead up to problems which demand strategic planning form the chain of cognitive consequences of computer learning environments.

Instruction can make explicit the skills required for strategic planning and debugging, thus fostering movement along the chain of cognitive consequences. The ACCCEL project has devised a series of techniques for explicitly encouraging planning and debugging. For example, instruction which requires students to make an action diagram of their program prior to writing code encourages students to think about planning. In addition, instruction which requires that students describe at least two hypotheses to explain a bug in their program, before trying to fix it, encourages students to develop debugging skill. In contrast, educational programs which allow students to compose their programs at the keyboard may result in students writing what has been called "spaghetti code", that is, code which is totally unplanned. Educational programs which pay no attention to debugging may encourage haphazard substitution of new code rather than analysis of what went wrong. In the section on teacher professional development, we discuss in greater detail the advantages and disadvantages of explicit instruction for development of higher cognitive skills such as strategic planning.

Pre-college education courses can foster cognitive outcomes by providing an introduction to the information which students might use in computer-related careers and computer-based problem solving in college courses. The problem-solving skills of strategic planning are likely to figure strongly in this instruction. In addition, expert computer problem solvers have developed a repertoire of effective templates for solving problems in their subject matter area. For example, they develop "sorting" templates. Introductory computer courses can and should provide an introduction to these templates. As students gain a repertoire of templates, such courses can also help students develop criteria for selecting an appropriate template for a problem. If the ability to select an appropriate template for a problem is emphasized, it is more likely that each additional computer learning course will allow students to advance along the chain of cognitive consequences.

The cognitive consequences of programming might include generalization to non-computer environments. It has often been pointed out that transfer from one learning environment to another is infrequent and, at best, difficult to accomplish. Recently, researchers have identified meta-reasoning skills as possible subject matter and context independent problem-solving skills used by students. Strategic planning can be seen as one of these skills. Strategic planning is often acquired in a specific subject matter area. It is not uncommon for students to have difficulty discerning which information is subject matter-specific and which is subject matter-independent. Only after a long series of problem-solving experiences do students start to recognize which skills are independent of subject matter and which are tied to subject matter. Courses which provide many problem-solving opportunities and help students recognize their meta-reasoning skills have the potential to enhance problem-solving skill in new domains.

In summary, optimal cognitive consequences from computer learning environments are frequently prevented because instruction fails to emphasize them. School-based planning can change this situation. Much of computer instruction involves drill and practice, which rarely emphasizes higher order problem-solving skills. Even instruction in programming, which has the potential for emphasizing higher order skills, frequently fails to do so. Much of computer programming instruction, as it is currently practiced, focuses on language features rather than on how to combine those features to solve problems. Thus, to enhance the cognitive consequences from computer environments for learning, computers must be used for solving complex problems and instruction must be geared toward planning and debugging rather than toward acquisition of language features.

Implementing a plan. Planning for effective computer-based instructional programs in schools involves specification of desired outcomes in a chain of cognitive consequences including the impact of computer-based programs on other portions of the school curriculum. It is useful to consider, for example, how courses such as typing and mathematics might be affected by an increase in the number of pupils who have computer expertise. Although such forecasting is admittedly

difficult, it is required in order for schools to have effective responses to this important educational innovation.

Effective planning for cognitive outcomes from computer learning also requires coping with the impediments discussed above. Decisions about hardware selection, software selection, and curriculum design often seem fraught with difficulty. Hardware selection depends on the products on the market. The available hardware in the area of computer education is rapidly changing. If one waits for the price to come down or for the best product to be developed, one will wait forever. Decisions have to be made based on what is currently available. Sometimes it is frustrating to make these decisions, however, they cannot be avoided. Computer learning can occur on a variety of available microcomputers as well as larger computers. It is desirable to select hardware which runs the software that you most want to use in your program and not to assume that "promised" software will necessarily be available later on. Decisions have to be made using the hardware and software currently available and assuming that although the situation will change it is not possible to anticipate the direction of that change very effectively.

The selection of software for computer-based environments should reflect the cognitive consequences which are desired. Currently, only a small portion of the available curriculum materials emphasizes strategic planning and debugging, which seem to be among the most unique and valuable cognitive consequences from computer learning environments.

Planning for Affective Consequences

Computer learning environments have the potential for influencing affective outcomes as well as cognitive outcomes. A diverse group of affective consequences of the computer learning environment must be considered in school-based planning.

First, computer education programs can help overcome apprehension sometimes associated with computers. Some students express apprehensions about breaking the computer or concern that the computer might gain control of them in some sense. For almost all learners, this apprehension is overcome quickly because it stems from lack of complete knowledge of the environment. For a few learners, more comprehensive programs such as those developed by the EQUALS program at the Lawrence Hall of Science are needed.

Second, computer education programs can build self-esteem and confidence in one's ability to use computers. Programs which provide the opportunity to use higher cognitive skills have a greater potential for fostering such affective consequences. Recently, we observed a 12-year-old girl solving a complex graphics problem while muttering to herself, "I'm so smart, I can do this." The interactive nature of the environment allowed her to see and correct her mistakes and to recognize that she was making progress on a non-trivial problem.

Third, students can gain confidence and skill in learning autonomously from the computer environment. Much of student learning occurs autonomously, but often it is inefficient and ineffective. The opportunity for interaction and precise feedback when using the computer allows learners to engage in productive autonomous learning, to succeed on difficult problems, and ultimately to gain confidence that they can solve complex problems on their own.

Evidence for autonomous learning comes from the many junior high and high school students who become "expert" programmers, even though courses available to these students typically provide only an introduction to the subject. In spite of this limited exposure, a reasonable number of students learn to program complicated problem solutions. Many of these students have computers at home, others have access to computers during afterschool hours at libraries, museums or computer stores. Computers provide a vehicle for students who desire to learn autonomously to achieve a satisfying outcome.

Fourth, well-planned computer learning experiences have the potential of ensuring that computers will be viewed and used as tools to foster humanitarian goals rather than as means to the mechanization of society. Students who collaborate with their peers to solve problems using the computer are likely to see how this tool can help society. Currently, computer classrooms are among the most interactive. When students encounter bugs in their programs, they generally seek help from peers. Often, students work in teams to design and implement problem solutions. If the problems are complex and if the instructor rewards group work, students often learn to value the contributions of their peers. For example, a group of students is far more likely to generate several possible hypotheses for a program bug than is an individual. Although it is difficult to organize a classroom so collaboration is rewarded, the payoff both in problem solving and in "humanizing" the role of the computer makes such action worthwhile.

Implementing a plan. Planning for effective affective outcomes involves considering both the cognitive demands of the learning environment and the desired affective consequences. Apprehension can be overcome most quickly if computers are fun to use. Self-esteem increases when students solve complex problems. Students are likely to learn autonomously only if they are given problems to solve on their own and if the feedback available provides encouragement. Finally, learners are likely to see the value of computers to humanity when they use it as a tool to foster communication between themselves and their peers.

Planning for Equitable Outcomes

A concern in fostering student outcomes from computer learning environments is the equitable distribution of those outcomes. Lack of access to computer instruction is the major factor which prohibits equitable outcomes from computer learning environments. Females and students in low socioeconomic groups are considerably less likely

to gain access to computers than males and those of high socioeconomic status (see Tables 2 and 3). Unless this trend is reduced or eliminated, we can anticipate a strong effect on society. Widening the gap between those who have technological competence and those who do not, further limits the learning potential of those who fail to gain technological expertise. The inequitable distribution of computer learning experiences is already a serious problem; steps must be taken to alleviate it.

Data on the participation of males and females in computer learning environments are reminiscent of the situation in advanced mathematics courses which was publicized in the late 1960's. In California, of the 27,378 students enrolled in computer programming classes in high school, only 37 percent of those students are female. Researchers report that less than 30 percent of the students at computer camps are female. The Lawrence Hall of Science reports that approximately 27 percent of students enrolling in computer courses are female. Female participation in computer learning experiences is much lower than that of males. By requiring courses in computer learning, schools can help to alleviate the situation. By encouraging females to participate in computer learning experiences, families can address this important concern.

The advantages of gaining technological expertise have been well documented both in the area of potential income and in the area of access to further educational experience. Before computer learning experiences become a barrier for future participation in mathematics and science courses and in certain high paying careers, this trend of unequal participation of males and females in computer courses must be reversed.

Implementing a plan. Planning for computer learning environments must include an important emphasis on equitable student outcomes, including increased opportunities for those who failed to get them in early schooling. As the statistics described above point out, the inequality of access to computer learning is already a major problem. Planning efforts must include procedures which insure equitable participation of males and females and of those from high and low socioeconomic groups in computer education programs. Some of this planning can occur at the school district level, other important planning must occur at the state and federal level in order to insure that both districts with high socioeconomic status as well as those with low socioeconomic status provide equitable computer learning opportunities.

Planning Effective Teacher Professional Development

A major problem in the area of computer environments for learning is the lack of training available to teachers in such environments. Even when such training is available, very frequently school districts lack funds for it. Teachers are frequently asked to teach computer-based courses with little or no lead time for planning, minimal training and minimal resources.

Table 2

Participation of Males and Females in

Computer-Related Activities

Enrollment in High School Computer Classes in California		
Class	Number Enrolled	Percent Female
Word Processing	1,024	87
Data Processing	800	56
Computer Literacy	9,044	43
Computer Programming	27,278	37
Other Courses Combined	13,335	47
Total	51,481	42

Enrollment in Lawrence Hall of Science Computer Classes, 1981-1983		
Class	Number Enrolled	Percent Female
Micros for Micros (Games)	171	37
Creative Play (Games)	600	30
Beginning BASIC	998	26
Pilot	284	33
Intermediate BASIC	378	19
Other Courses Combined	262	23
Total	2,693	27

Majors in Computer Science at U.C. Berkeley 23% female.

Table 3

Availability of Microcomputers*

by Socio-Economic Status (SES)

	Predominantly White			Predominantly	All
	High SES	Middle SES	Low SES	Minority Elementary	
Median % of students who use microcomputers in a week	24	22	12	13	16
Median minutes of use per week of student user	24	22	35	18	23
Percent reporting "intensive" use of microcomputers					
for drill and practice	13	18	9	33	18
for programming	21	17	49	10	23
with "above average" students	24	30	51	26	31
with "average" students	14	9	22	12	12
with "below average" students	16	12	10	32	14

* Taken from School uses of microcomputers, Issue 3, October, 1983, Center for the Social Organization of Schools, The Johns Hopkins University, Baltimore, Md.

Although the majority of teachers providing computer learning environments lack high levels of expertise in computer education, there is a core of expert teachers and their skills must be capitalized upon. Rather than having one teacher after another reinvent excellent procedures for teaching computer programming and problem solving, it is essential that expertise that has been developed be shared. Many successful professional development programs for teachers capitalize on helping expert teachers make their expertise explicit and share it with other teachers. For example, the Bay Area Writing Project and the Bay Area Mathematics Project bring teachers together, have them share their ideas, and start to make their expertise explicit.

Recent advantages in psychological and educational research have, in many cases, been consistent with the ideas of thoughtful and expert teachers. When teachers are asked to make their knowledge explicit, the relationships between their knowledge and the findings of recent research can be articulated. Research findings combined with the knowledge of expert teachers can be used to develop effective professional development programs.

An example of the interface between teacher expertise and recent research occurs in the area of explicit procedures for problem solving. Teachers frequently employ discovery learning procedures rather than explicit instruction in problem solving, although critics sometimes claim that discovery learning is too time consuming and that explicit instruction for solving the problems would be more effective. The preference for discovery learning frequently voiced by expert teachers is reflected in recent research. This research reveals that explicit or direct instruction tends to have value for some learners. Explicit instruction apparently helps learners who have no clues as to how to proceed in a given problem-solving situation and who require considerable instructional support in order to solve problems. These learners are usually of lower general ability than learners who respond well to discovery learning. In addition, they frequently have less experience with the subject matter domain than those who perform well in the discovery learning mode.

On the other hand, students who profit from discovery learning are generally high ability students who have some knowledge of the subject matter area. These students profit more from discovery learning than from explicit instruction because they are able to devise their own algorithms and heuristics for solving problems. If algorithms or heuristics for problem solving are provided for them, then these instructions may duplicate their own problem-solving process and may dissuade students from developing an "understanding" of how to solve the problems.

Thus, an aptitude treatment interaction where students with high ability are encouraged to learn i[illegible]iscovery mode while those with low ability are provided with dir[illegible] instruction is suggested. Results from one of the ACCCEL research studies which investigated student performance on WUMPUS tends to support this point of view. In that study, explicit instruction was helpful for low-ability

learners while some high-ability learners profited from a more discovery-oriented form of instruction.

Thus, teacher professional development can be fostered by capitalizing on the knowledge of expert teachers and by relating that knowledge to recent research advances. Together, these two forms of information can be combined to create better instructional programs than either form would provide on its own.

Teacher professional development can also be fostered by the networking of teachers to share especially effective practices. Networking of teachers has the advantage of encouraging the dissemination of information developed at local sites and freeing teachers from the necessity of reinventing procedures.

Implementing a plan. Teacher professional development must be an important component of any plan for computer learning. It is unreasonable and ineffective to assume that large numbers of teachers will train themselves to use such a complicated tool. When businesses adopt word processing or economic spread sheet software, they provide extensive training for the professionals who will be using those tools. Similarly, teachers deserve extensive training in use of new professional tools.

There is a growing understanding of the process of teacher professional development. Knowledge is emerging at both research universities and local schools. It is necessary to build new models for linkages between schools, universities and research agencies which foster effective school practice. For example, the relationship between teachers' perceptions of discovery learning and recent research on discovery learning can be investigated by teams representing local school practitioners and researchers.

A Model of Computer-Based Instruction

Both the ideas of expert teachers and the results of research on computer learning environments are beginning to suggest a model of computer-based instruction which could have far-reaching consequences. Such a model is needed to clarify how instruction can capitalize on the unique features of computers. For example, the emphasis on explicit instruction in conjunction with discovery learning becomes far more central in educational decision making using computers than it does in other aspects of the curriculum. The desired effect from explicit instruction is frequently not accomplished in non-computer-based learning environments simply because of the difficulty involved in implementing it. Computers provide the opportunity for explicit instruction and also provide the necessity of making decisions about whether explicit instruction is appropriate for all learners.

Computer learning environments provide the opportunity for emphasizing aspects of the curriculum that might be difficult or impossible to emphasize without computers. For example, strategic

planning knowledge is rarely taught in regular classrooms, simply because it requires a great deal of student and teacher interaction. Computer environments provide numerous subject matter areas where strategic planning knowledge might be encouraged and where students can gain explicit and direct feedback on the effectiveness of their strategic planning. Even when strategic planning is required in non-computer learning environments (such as in the construction of geometry proofs), feedback may be lacking in explicitness or may occur a long time after the problem has been attempted. Computer environments provide opportunities for more explicit and more immediate feedback.

Important contributions from both research universities and local schools are necessary for the development of a model of computer-based instruction. The input of expert teachers, as well as the results of recent research such as that conducted by the ACCCEL project, need to be combined in order to form an effective model. Computer-based instruction provides an especially exciting opportunity for this interaction.

Conclusions

The potential of computers in education provides a rare opportunity for educators. The computer can greatly increase the likelihood that the educational reforms called for by recent national commissions will be achieved. To accomplish this, we must narrow the gap between the promise of computers in education and the reality of their use in schools.

School-based planning can increase the effectiveness of computer learning environments. Unless schools respond to the gap between promise and reality in computer education, the gap will widen. The impediments to effective computer education will increase unless schools demonstrate that they want to use computers to their full potential. If schools demonstrate that they want cognitively demanding software and integrated curricula, if schools develop the ability to select effective software, and if schools seem to be making informed rather than haphazard decisions about hardware and software, then developers will be more eager to develop products for the educational market.

Schools and researchers can work together to gain more understanding of the potential of the computer learning environment, to clarify desired outcomes for students, and to establish the chain of cognitive consequences from computer learning environments. Expert teachers are designing programs to capitalize on computers. Research programs such as ACCCEL are conducting investigations of the chain of cognitive consequences, examining the responses of males and females to computer learning environments, and gathering other information useful to educators. If these groups work together, planning can be simplified.

To capitalize on the potential of computers in education, resources must be allocated effectively. The temptation to purchase hardware rather than investing resources in planning and in teacher professional development may impede optimum program development. The issues surrounding implementation of computer education programs are complex; they deserve serious and thoughtful consideration. The costs of planning and teacher professional development are small relative to their potential benefits.

Ultimately, effective use of computer learning environments requires the design of hardware, software, and curriculum materials focused exclusively and specifically on the problems of schools. The development of such a response requires the cooperation of schools, state governments, federal governments, and research agencies. Without the effective integration of all of these agencies, we can continue to expect to see sporadic and incomplete efforts in computer learning and we can continue to expect to hear about the gap between the promise of computer learning environments and the reality of instructional use of computers in schools. The macro expectations for computers in education will be met with micro outcomes unless thoughtful individuals and substantial resources are devoted to this problem.

The potential for the use of computers in the instructional environment is phenomenal. It would be irresponsible to ignore this potential. Substantial, serious, and concerted effort is needed in order to incorporate this new and effective educational tool into creative, innovative, and extensive educational programs.

"Perhaps the most unique aspect about computers in education is that the influx of computers into the schools has been a grassroots phenomenon, and not a top-down innovation. The most common manner in which computers appear today in the classroom is due to the efforts of a particular teacher who has become interested in their educational applications and has figured out ways in which to use them in the curriculum."

THE CALIFORNIA MODEL CURRICULUM FOR COMPUTERS IN EDUCATION

Wendy Harris
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I'll be talking today about a project that we have underway at the State Department of Education. But to put this project into some context, it might be helpful to say a few words about the current status of computers in the schools, why this so-called revolution is so unique, how the state fits into this situation, and how the model curriculum project came to be in light of our perception of the state's role.

Unique Aspects About Computers in Education

Perhaps the most unique aspect about computers in education is that the influx of computers into the schools has been a grassroots phenomenon, and not a top-down innovation. The most common manner in which computers appear today in the classroom is due to the efforts of a particular teacher who has become interested in their educational applications and has figured out ways in which to use them in the curriculum. This is in contrast to the more traditional approach of a top-down innovation, where, for example, the state or perhaps a district mandates a particular learning approach (e.g., language labs) without proper training, without widespread school and community support, and with no sense of integration within the curriculum.

A second aspect about computers in the schools is that the grassroots nature of the movement has generated a tremendous amount of enthusiasm about teaching in general. In the face of low salaries, not altogether ideal working conditions, and other barriers, teachers tend to be highly enthusiastic about the use of computers in their classrooms. I believe this is translating into a greater excitement about teaching in general than we have seen for a long time.

Finally, unlike the influx of TV, language labs, and other so-called technological innovations, computers appear to be here to stay. Assuming current problems such as lack of sufficient in-depth training and lack of innovative and high quality software can be addressed, computers have the capacity to revitalize the educational system.

What Is It About Computers That Makes Their Use in Education So Exciting?

1. They give students the capacity to acquire information efficiently, and through another medium. In this process, computers teach valuable skills that will help students live and work in the "information society."

2. They present possibilities for teaching subject matter outside the regular curriculum, and in some cases, beyond the specific knowledge of the teacher.

3. They provide feedback to the individual learner, allowing pacing according to the learner's capability.

4. They open up the possibility for learning that is inherent in simulations that might otherwise be too costly or dangerous.

5. Through experiences such as programming, they develop the capability of the learner for more logical thinking and analysis skills.

Role of the State in Increasing the Effective Use of Computers in Education

So, where does the state fit into this apparent rosy picture of computers in education? Actually, the picture is not quite so rosy, at least not yet. There are real implementation problems to be solved in the areas of training, hardware, software, and curriculum development. In addition, equity considerations are looming on the horizon as a major area of concern.

We see the role of the state as one of addressing equity and other such problems that act as implementation barriers to effective utilization of computers in education. Another problem area, in addition to equity and which is the subject of today's session, is that of effecting whatever changes are needed in curriculum so that computers can serve as effective learning tools to promote the educational goals and priorities of the schools.

The Model Curriculum for Computers in Education

We felt that one of the most useful things the state could do is to provide schools with a rich and varied source of ideas for improving the general educational level of the schools through the use of computers and computing. Thus, we are in the process of developing a computer education model curriculum. Its final title will be "Computers in Education: Goals and Content."

Background and Rationale for Project

Many groups recently, most notably the National Commission on Excellence in Education, have called for a refocusing on the "very study" of education--the core curriculum for areas often referred to as the New Basics (English, math, science, social studies, and computer studies). In California, the Superintendent has made the development of a "core curriculum"--substantive statements of expectations for student knowledge, skills, and concepts--a priority mission for the State Department of Education.

It is our hope that such a series of statements will help mobilize the educational system to set and achieve a high level of expectations for students. The intent here is to raise both the floor and ceiling of student achievement--not produce yet another "minimum" proficiency. It is also our hope that strong statements will help drive other parts of the system. For example, internally, it could drive development of handbooks, frameworks, and testing. Externally, it could drive teacher training, local curriculum, and textbook content.

Finally, another rationale for this project is a mandate in SB 813 for the State Board of Education upon the advice of the Department, to adopt a model curriculum in computer studies for students in grades K-12.

Process of Development

The content of the document was produced by a small working committee, with representatives from schools, district and county offices, and TEC Centers. The review process contains several steps. We now have a good working draft of the document. The next step will be a broad field review of perhaps 40 individuals.

In addition, informal speaking engagements such as this are excellent ways for us to get feedback. We expect to publish the document by around February. A usable draft should be available just after the first of the year.

What the Curriculum Is and Isn't

This curriculum provides the state's perspective on the uses of computers in education and what knowledge, skills, and values all students should acquire about computers by the time they graduate. The document takes the point of view that while there clearly will be different levels of expertise developed in each skill area, all students should be provided the opportunity to use the power of computers in different ways and in many different subject areas.

The curriculum is a document intended for all educators. However, it should be most useful for purposes of driving local curriculum development. This is not a scope and sequence from the state. Such an effort should be locally developed. Moreover, this is not meant to be a rigid document. As technology changes, it too must change.

The curriculum also serves as a vehicle to send certain messages regarding the uses for computers in schools. For example:

- Extensive hands-on experience must be provided for all students at all grade levels
- The most beneficial experiences are those in which the student has control over the computer
- The use of computers should be integrated throughout the curriculum at all grade levels
- All students should learn to program the computer to some level of proficiency
- The computer provides a powerful and direct way to teach critical thinking and problem-solving skills

Finally, the document itself serves as the state's definition of computer literacy. Computer literacy is not defined specifically as a term in the document. Rather, by laying out a broad array of skills and knowledges, it covers all the topics that could conceivably be bundled under the rubric of computer literacy. Any educator wishing to design a computer literacy program will find all the relevant content in the model curriculum.

Organization of the Document

The document is deliberately organized to provide for flexibility in local curriculum development. It doesn't specify exactly what should be taught when. The five major sections, or strands, should be thought of as running in parallel, with a given use of computers addressing skills and knowledge from several strands. Skills in initial strands are not intended to be completely addressed before skills in other strands are initiated. The strands are:

- Operation of Computer Systems
- Computer Applications

- Thinking Skills Through Programming
- Computer Science
- Societal Impact of Computers

Content of the Model Curriculum

a. Operation of Computer Systems

This strand deals with skills and knowledge students require in order to successfully and safely operate a computer system. It is important that the content of this strand be taught in a hands-on fashion in conjunction with material from other strands.

Thus, young students should be learning to identify and use alphabetic and numeric keys in the context of using instructional software or a simple programming language. These experiences should begin as early as possible in a student's educational career, preferably in the elementary grades. Students need to acquire knowledge and skills in the following areas:

(1) Keyboarding skills

(2) Systems components--for example, knowledge of how a system is put together, what role various storage devices play, how telecommunications systems work

(3) Computer operation--in essence the ability to perform basic tasks with software, e.g., load, list, erase, break, etc.

(4) Computer applications--this is dealt with quite substantively in the next strand. In this strand, the intent is to have students acquire an awareness level of knowledge about such applications as word processing, spreadsheets, data base and file managers, graphics programs, programming languages, and when they might be most useful.

b. Applications

This strand has to do with using computers as a tool to accomplish certain tasks. We don't regard applications in the narrow sense as data base management programs, spread sheets, or word processing, but rather as a continuum from Computer Assisted Learning (CAL) material through these applications I just mentioned to programming itself. That is, the computer can be applied in an educational setting in all of these ways.

Underlying this continuum is the idea of student control over the computer. At one extreme, drill and practice, as one form of CAL, represents an activity in which the student essentially has no control over content or presentation strategies. Formal programming, on the other hand, puts the student fully in control of the computer and its operation. Other types of applications lie somewhere between these extremes; the level of control depends on the specific application.

In each of the general classes of applications I will mention, there is a broad range of skills to be taught and the software that can be used ranges from the relatively simple to very complex. The particular subject

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areas to which they are applied and the specific software that will be used will depend upon the level of sophistication of the teacher and the developmental level of the students. The following are the general classes of applications:

Computer Assisted Learning (CAL)

The curriculum describes CAL materials in terms of drill and practice, simulations, tutorials, and educational games. The point is made that all students should have as many opportunities as possible to use these applications throughout the curriculum. Furthermore, in planning CAL activities, in addition to selecting materials with the appropriate content and level of difficulty, it is important to consider what critical thinking skills students have to employ in working the materials, and the level of control they have over the computer and the educational content.

Word Processing

Electronic Spreadsheets

Data Base Managers

c. Thinking Skills Through Programming

This model curriculum is based on the premise that all students should be provided with the opportunity to learn the fundamentals of computer programming. Among the most important reasons for this premise are that:

(1) Programming puts the student in control of the computer, providing a sense of power and accomplishment and enhancing self-esteem.

(2) Programming provides a very direct method of teaching a wide range of critical thinking skills, problem-solving skills, and communication skills. It is these which we feel are among the most enduring types of skills that are acquired throughout schooling.

(3) Programming a computer provides unique insights into the relationship between people and machines, thus demystifying the machine.

(4) As with language arts and reading, once a student has mastered some elementary thinking skills, they can be put to work in other areas of the curriculum.

The skills and examples in this strand are generic in nature and are intended to make explicit the primary purpose for teaching programming--the acquisition of a set of problem-solving skills and strategies that are computer language independent and applicable to problems in a wide range of subject matters. An important concept in implementing this curriculum is that each of the generic problem-solving skills should be addressed many times in different content areas and in ever more complex situations.

The following are the problem-solving skills described in the model curriculum:

(1) Describing the problem in your own words
(2) Breaking down the problem into manageable pieces

(3) Developing algorithms
(4) Anticipating outcomes and unforeseen events
(5) Generalizing a problem solution
(6) Debugging
(7) Communication skills

In teaching these thinking skills through programming, there is clearly a set of programming skills <u>per se</u> that have to be taught. These are primarily language independent, although some are not possible at all in some languages and others much easier in some languages than in others. <u>Examples</u> are:

(1) Define and use simple procedures and subroutines.
(2) Use control structures for simple iterations (loops and recursions) and choices (branches).
(3) Define and use numeric and string variables.
(4) Design appropriate error trapping routines.

A fuller list is provided in the model curriculum itself.

d. <u>Computer Science</u>

This section of the curriculum describes content that is primarily elective in nature. In general it would be taught in a formal computer science course. It is not suggested that all, or nearly all, students would be capable of mastering this content or of benefiting from it. It is important to point out, however, that this material overlaps with that in other strands, and that what is covered with students should be dependent on their skills and interests, not on some arbitrary division of content.

<u>Skills and Knowledges</u>

- Understand the use of high-level languages, compilers, and interpreters
- Understand the use of assembly language and assemblers
- Understand number systems used in computers
- Understand various data representation schemes
- Understand how data is stored and accessed in memory and on discs
- Understand the basic architecture of computers
- Understand elementary electronic circuit design principles

e. <u>Societal Impact</u>

As with all areas of the curriculum, this one should be covered in a wide variety of settings and subject matters. While the proposed content is computer related, it cuts across subject matters; the major headings have been chosen to reflect this. For example, while the ethical considerations surrounding copyrighted software should clearly be dealt with directly in the context of computer use, they also have a place in social studies units devoted to societal ethics in general.

The skills and knowledges in this strand fall into the following areas:

(1) Ethics and Values
(2) Impact of Computer Technology
(3) History of Computers and Computing
(4) Technological Consumer Skills
(5) Vocational/Career Information